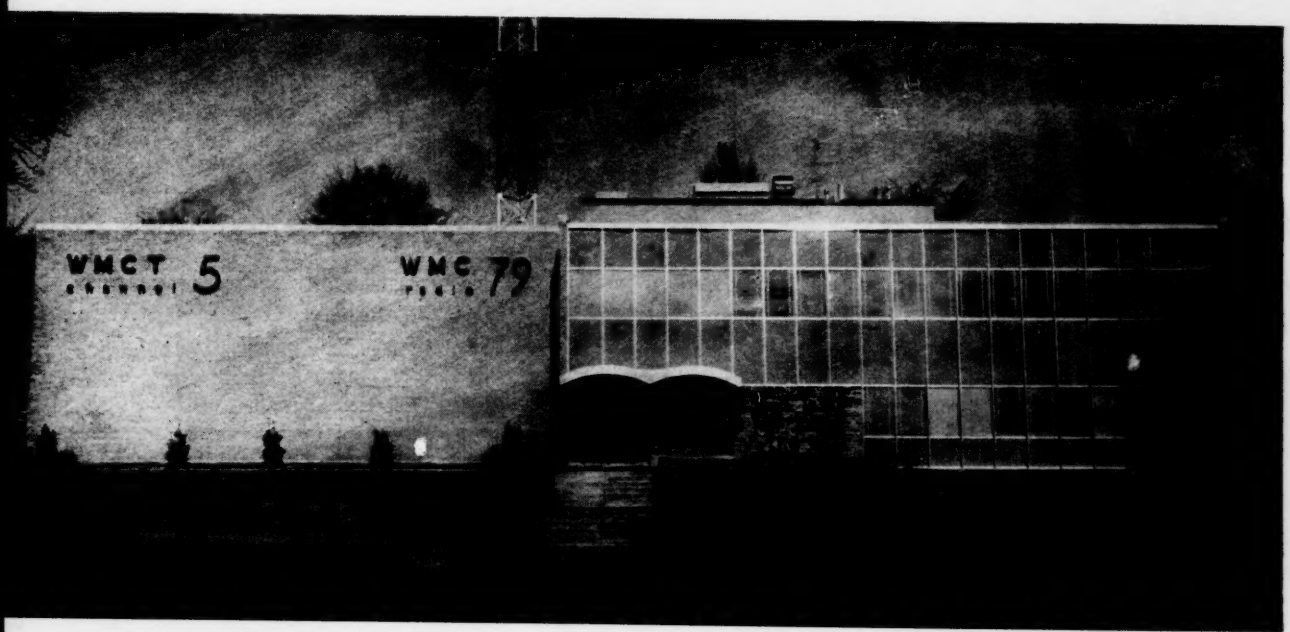
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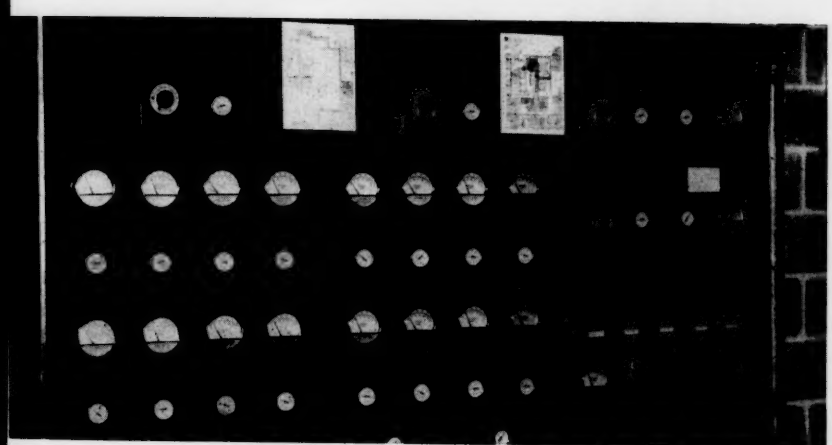
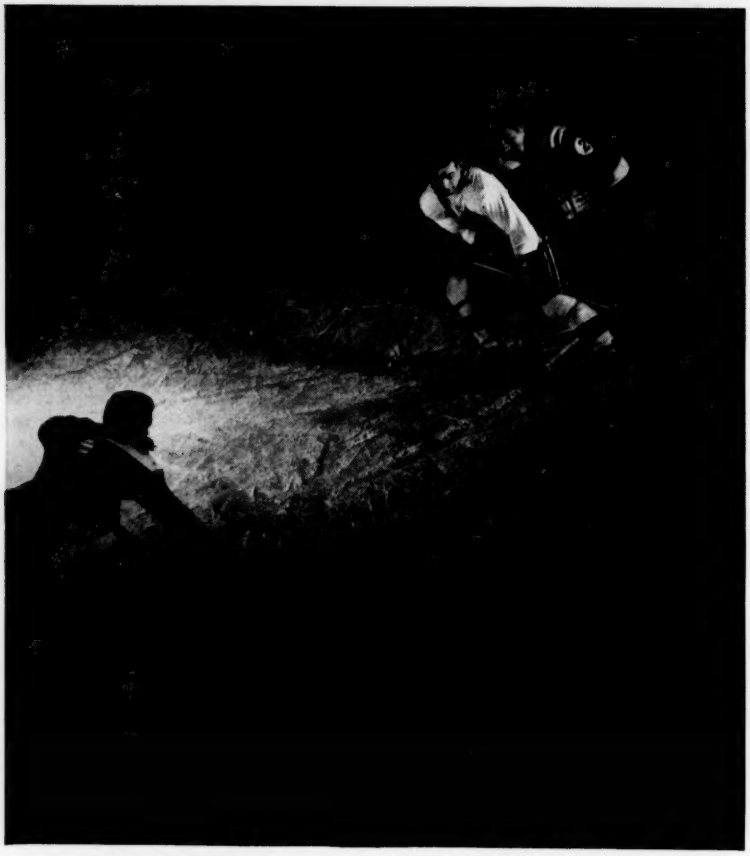


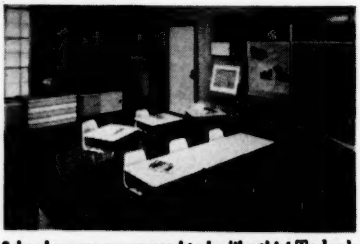
In skating rinks . . . skyscrapers . . . schools . . .



Hockey—"the fastest game in the world"—is rapidly becoming America's number one winter spectator sport. For years, players from Canada—where the temperatures favor hockey all winter long—have dominated the National Hockey League. Recently, however, an increasing number of American schools and colleges have installed artificial ice rinks on the campus. As a result, we may soon see more hockey players from the U.S. making the pro teams.

New air-conditioned office buildings like this are changing New York City's skyline every day. By 1960, it's expected that more than 50% of major office space in Manhattan will be air-conditioned.

Photo courtesy Carrier Corp.



School rooms never used to be like this! Today's classrooms are lighter, brighter—and more comfortable, thanks to modern air-conditioning systems that keep temperatures level and end drafty or stuffy classrooms.

Photo courtesy Brunswick-Balke-Collender Co.

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GENERAL CHEMICAL DIVISION
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Sept., 1959

Number 3

Vol. 137

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Gas and water vapor trapping can be accomplished in many instances as economically with mechanical condensing units as with costly expendable refrigerants.

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The COVER: Memphis TV-Studio; Air Conditioning Control

▶ COMMUNICATIONS EQUIPMENT although well advanced in design and utility, still produces that unwanted by-product—heat. Close RH tolerances of the equipment, also, requires an industrial air conditioning plant of 155 TR at the *Commercial Appeal* stations, at Memphis, Tenn.

Formally dedicated earlier in the year, the plant facilities were inspected by Tenn. Chap. No. 1, NAPRE, in June. Pneumatic controls pictured, regulate the operation of a 185 TR centrifugal water chiller of which only 30 TR is used for personnel comfort.

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news briefs of the month

Educational Seminars Resumed By TRRF

First Regional Seminar for key operating personnel of the refrigerated warehousing industry, will be held September 22 and 23 at Hilton Inn, International Airport, San Francisco, California, by The Refrigeration Research Foundation. Meetings in other regions of the United States will follow, with all educational programs open to both member and non-member firms. Previous seminars sponsored by TRRF-NARW jointly were national in scope, the last being held at Purdue University in 1957.

Special emphasis will be given to relationship of Time-Temperature-Tolerance findings and a proposed standards of good warehousing being considered for adoption by various legislative or regulatory bodies. Spray and immersion crusting of turkeys is another major topic on the San Francisco agenda. The Scientific Advisory Council, TRRF, is conducting the seminars with the Pacific States Cold Storage Warehousemens Association in charge of the arrangements.

Compressor Report Published By ARI

Manufacturers' Shipments of compressor bodies during the first 4 months 1959 was reported July 30 by the Air Conditioning & Refrigeration Institute. Over 2½ million units were shipped, but comparisons with 1958 were not possible since the new reporting form of the Institute includes units for household refrigerators. They were not previously reported.

Figures for automotive air conditioning compressor bodies were comparable, however, and showed an increase of nearly 50,000 over the same period in 1958. Slightly less than 200 compressor bodies of 100-hp and over were shipped, but over 600 NH_3 compressors of various sizes were produced.

NIA-TRRF Affiliate On Ice Research Data

Announced in the INFORMATION BULLETIN, TRRF, in July was the affiliation of the National Ice Association with The Refrigeration Research Foundation for research purposes. Services of TRRF will be utilized by NIA in reviewing technical literature for research results pertinent to the ice industry. These reports will be reviewed, abstracted and interpreted by the Foundation. Such information will then be edited and distributed by NIA. According to ICE NEWS, August, NIA's executive committee voted unanimously at its July 10 meeting to accept the TRRF invitation.

Biotron (Climate Lab) At Univ. of Wisc.

Accepted by the Regents of the University of Wisconsin in mid-July was a $1½ million dollar grant to the National Science Foundation to build a two unit Biotron—a climate laboratory. One unit will be a Phytotron and the other a Zootron to study plant and animal growth, respectively. Controlled environmental rooms will require refrigeration with temperatures expected in the nature of minus 60 F.

Quality Changes Hastened By Transparent Wrappers

Announced by USDA on September 1, was a report on accelerated loss of high quality in frozen peas exposed to light. The change noted at 0 F, was several times faster at 20 F. Frost formation developed more rapidly in packs under light than those held in the dark. The report does not suggest that transparent packages should be avoided, but suggests that handlers must be especially careful about time-temperature limits when exposed.

Eggs Keep Better In Plastic-Wrapped Cartons

Tests at Montana State College indicate that overwrapping cartoned eggs will help maintain quality for a longer period. Cartons of fresh White Leghorn eggs were placed in Cryovac and Polyethylene overwraps, and in cartons without wraps, and held at temperatures at 34 F, 50 F, and room temperature. At refrigeration temperatures both wraps were equally effective in maintaining high unit values and reduced weight loss.

These units deliver exactly what they promise

"We selected Krack units for the 'Centrella' refrigeration system because they produce at rated capacities. We can design to specifications without fear of underestimating performance."

—A. W. Theis, Theis Refrigeration, Chicago

PURE Centrella FOODS
KRACK SPECIFIED

Central Grocers Cooperative's new, ultra-modern warehouse in Franklin Park, Illinois serves 400 "Centrella Foods" member grocers daily in a 4-state area. Frozen foods, meats, and dairy products are kept in fresh condition in 23,000 sq. ft. of refrigerated space served by 14 KRACK unit coolers.

The accurate capacity ratings of *all* Krack equipment give you these advantages:

1 *No need to specify "oversize" equipment*

When you select Krack equipment, you do not need to include costly "safety margins" in your estimate to compensate for uncertain performance. You can be sure that Krack units will deliver their full rated capacities.

2 *Get the "jump" in competitive bidding*

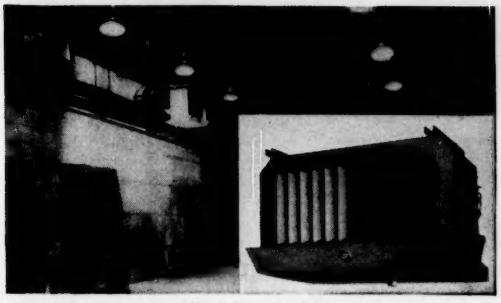
By specifying the right equipment for each job, you trim the "fat" off of both original equipment and installation costs . . . and consistently bid lower on all jobs.

3 *Save yourself installation headaches*

With Krack job-rated equipment you can complete more installations smoothly without hitches. Installations go faster . . . save you time and money.

4 *Eliminate costly callbacks*

Krack equipment will give less maintenance trouble than equipment which is not really rated for the job it has to perform. Specifying Krack equipment is a good way to retain priceless customer good will!



Cools at controlled humidity

6 Krack Ceiling Mounted Unit Coolers chill temperature in cooler room to 40° F. for controlled humidity cooling. Dual purpose drain pan catches drip from expansion valve and directs air flow forward and upward for correct air distribution.

Goodbye to ceiling frost

Krack Electric Defrost Unit Coolers keep temperatures in storage freezer room at 0°F. Heat is circulated *within* unit . . . is *not* released into room to create ceiling frost. For defrosting cycle, door automatically shuts, sealing interior of insulated unit. Automatic defrost is accomplished in a cycle sequence without shutdown of the entire system.

KRACK REFRIGERATION APPLIANCES INC

Manufacturers of freon, ammonia, flooded ammonia heat transfer equipment

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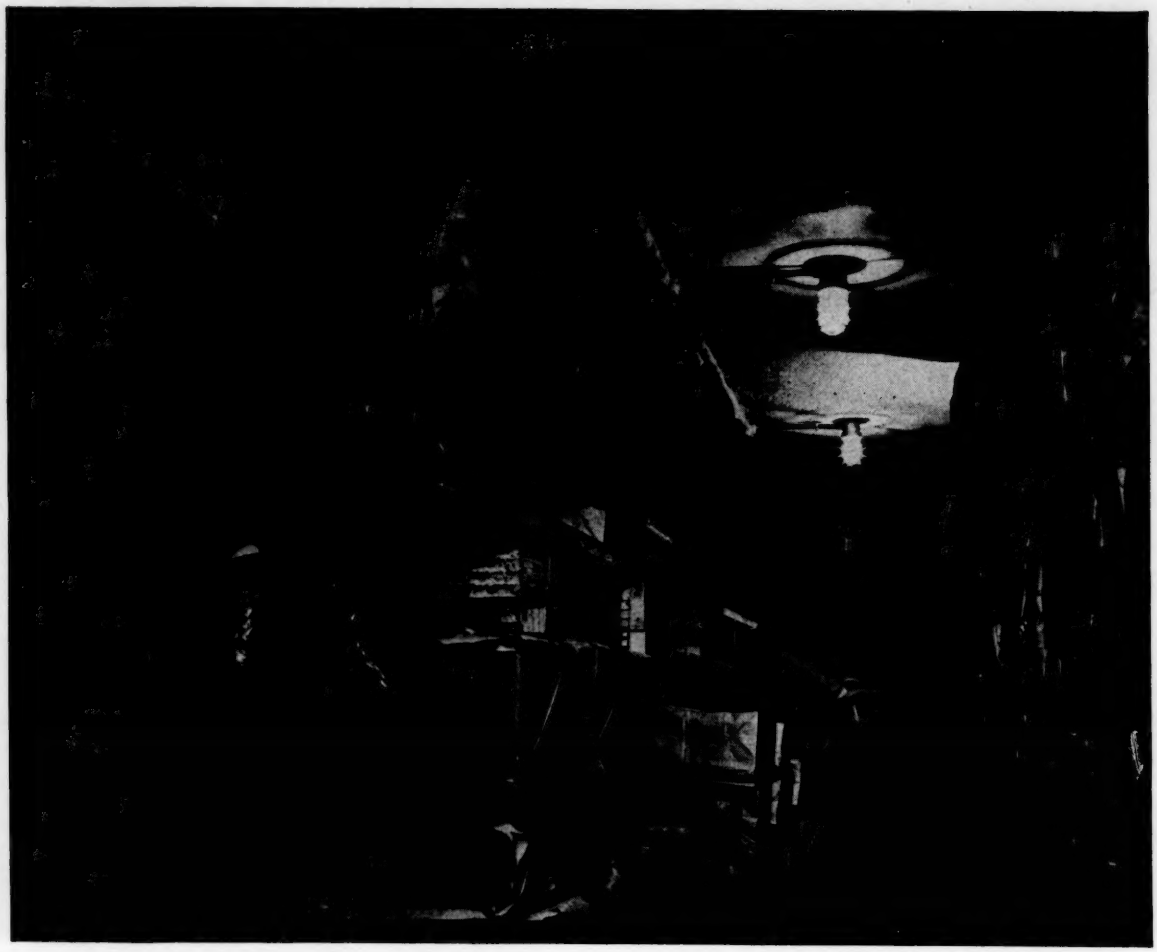


STYROFOAM®

Key to permanently low operating costs

When Styrofoam* insulates low temperature space, the long term costs of operating refrigeration equipment tumble to a new low . . . and stay low, permanently! There's no loss of insulating efficiency with the passage of time, thanks to an unmatched combination of physical properties.

Here's a rigid plastic foam insulation with thousands of tiny, individual air cells in every cubic inch. This cellular structure provides an extremely low "K" factor plus high resistance to the passage of water and water vapor. With Styrofoam there's no water pickup . . . consequently its heat conductivity stays low. And when heat load stays at virtually the same low level over years of service, your equipment operating costs stay uniformly low, too!

And here's another important factor in low operating costs. Because Styrofoam won't freeze, swell or crack — won't permit ice formation, often the cause of buckled insulation—there's no need for periodic replacement and your equipment won't have to work overtime removing heat introduced during repair.

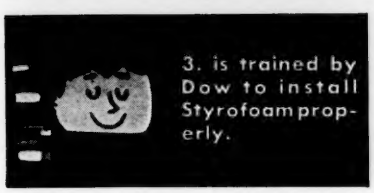
For more information, contact the Styrofoam distributor near you, or write THE DOW CHEMICAL COMPANY, Midland, Mich., Plastics Sales Dept. 2222BU9.

*Dow's registered trademark for its expanded polystyrene

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

SIGN OF AN OUTSTANDING INSULATION CONTRACTOR

Look for this seal when you build cold storage facilities. It's displayed only by contracting firms with a record of top performance in space insulation. This seal means the contractor . . .



For the names of Approved Styrofoam Insulation Contractors in your area, write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Dept. 2222BU9.

STYROFOAM®

STYROFOAM is Dow's registered trademark for its expanded polystyrene

DOW

What's New

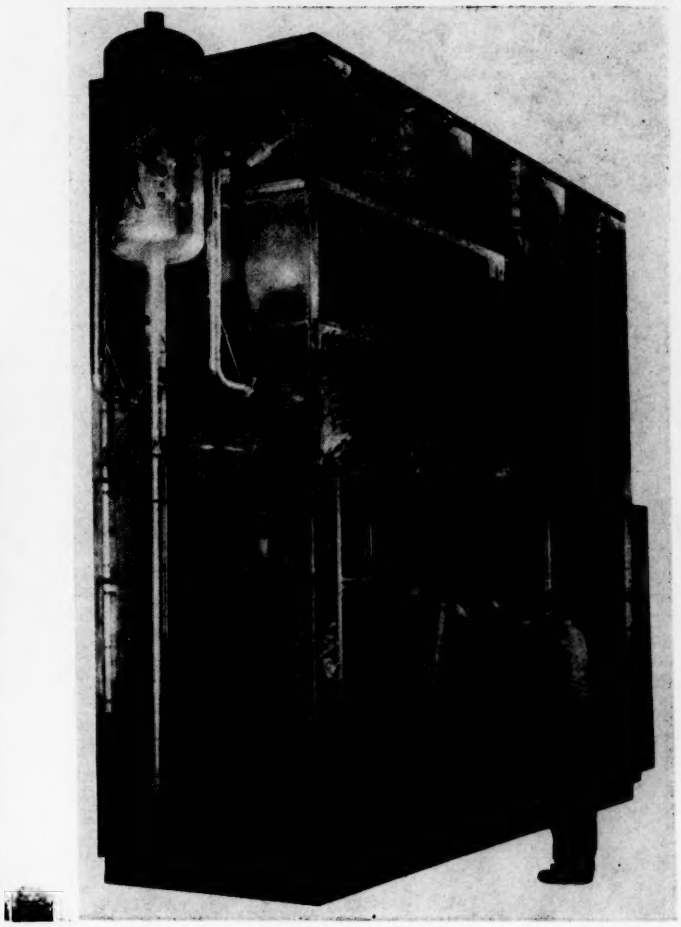
MACHINERY
APPLIANCES • PROCESSES

Fifty-Ton Air Blast Chillers Introduced

Accessories Help Hold Down Some Operating Costs

IMPROVED SYSTEMS, Components, new makes of machinery, are being introduced monthly. Management and up-to-date engineers keep track of this merchandise with an eye to refinement in their own plants. Even such items as 4-way defrost valves and pipe dope have significance in easing operating costs. Instruments and building materials are also important to maintenance.

Imeco Fabricates Huge Blast Chill Unit



PICTURED ABOVE is one of two large blast chilling units recently manufactured by Imeco, Inc., Chicago, for a national food processor who is using the units to rapid chill a processed dairy product. Packaged and palletized, the food enters the chill room as high as 120 F. Circulating 45,000 cfm, each, rapid air supply chills the packaged product to storage temperatures. Each unit is rated at 50 TR on 18 F TD.

Unique to these units are the filters being placed in their frames by the mechanic in the picture. Of the cleanable type, they remove carton dust which would otherwise be recirculated through the room. These assemblies, fabricated at the factory and shipped in two sections utilize fully flooded, float controlled ammonia as the refrigerant. There is no coil defrosting problem as refrigerant temperature is held above freezing by a back pressure regulating valve. For lower temperature applications, water or hot gas defrosting systems are readily applied.

. . . More News

WHAT'S NEW (Continued): Applications, Components,

Hygrol Air Dehumidifier

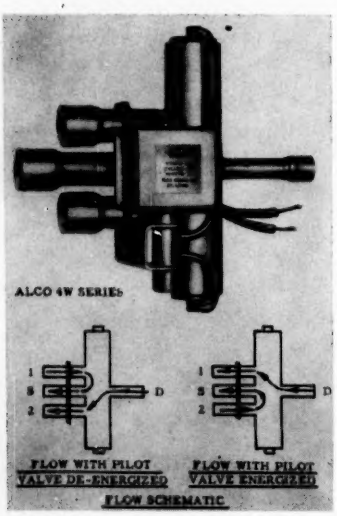
DEHUMIDIFIED storages and closely controlled humidity for process are on the increase. As a result more firms have turned their attention to this type of application. The *Hygrol* Air Dehumidifier described in the Niagara Blower Co. Bulletin No. 140, is typical of central station air conditioning plants using a liquid absorbent to control R. H.

This manufacturer has illustrated a number of industrial applications using their equipment which includes air conditioning on electronic computers, shellac drying, tobacco conditioning, sausage drying, biologicals laboratory, and air drying for wind tunnels.

A hygroscopic liquid described as being non-corrosive and stable, absorbs water in the conditioner. The air dew point is controlled by the liquid concentration and the dry bulb temperature is controlled by a cooling coil. A concentrator is provided for driving moisture off the liquid absorbent, outside the controlled areas.

Alco Develops 4-Way Valve

OFFERED as a means of shortening the defrost cycle, is a new 4-way reversing valve by Alco. The firm claims positive shifting under any operating conditions. The valve is designed so that it can be installed to shift to cooling or to heating for the "fail safe" position in the event of power failure.



The valves are made of cast iron and steel, the slide being cast iron and the outer shell steel. According to Alco, fine machining and precision honing make it unnecessary to use plastics for sealing or tight seating. Life tests have exceeded 300,000 cycles without failure to shift, or without loss of the seating.

Light Weight Truck Trailer

DESIGNED to reduce operating costs, a 16-ft long over-the-road trailer built to accommodate a 5-ton payload has been introduced by a Grand Rapids, Michigan manufacturing corp. The firm states this unit is the first of a new line of light weight equipment which incorporates special rust-proof laminated panels. The 1500 pound weight saving over comparable steel truck trailers has already meant sizeable savings in gasoline for the Flechtner Packing Co. of Fostoria, Ohio, according to Dale McCarty, owner.

Sandwich panels of 4- to 6-in. polystyrene foam core are laminated between 1/4-in sheets of exterior grade fir plywood over which polyester impregnated fiberglas cloth is laminated to form exterior and interior panel faces. This surface is reported to be chip and crack resistant and does not require painting. They are said to be more impact resistant than either aluminum or steel and eliminate structural members in the vertical framing of the body.

McCarty also explained that smaller tires were specified for the trailer because of its light weight construction, enabling the trailer and tractor tires to be interchanged and providing a more convenient working height. The same sandwich material is used for the reefer type doors and they are equipped with a door lock safety device to prevent the driver from being accidently locked inside the compartment.

Trailer Refrigeration System

POWER improvement introduced recently by a Michigan truck-trailer refrigeration unit manufacturer, is a hydraulic motor which drives a condensing unit at constant speed. In operation, the motor itself is activated by the live axle of the trailer.

Advantages of this application is the ability to mount the entire condensing unit and auxiliaries on the underside of the trailer chassis, and the more constant source of power while the trailer is in operation. A standby electric motor provides power for the system at night or during long stops.

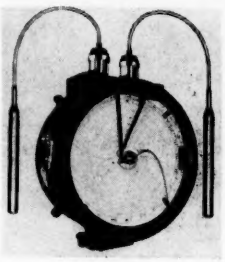
More Ice Making Units

POPULARITY of various forms of ice making apparatus in the U. S., has prompted the introduction of still more European equipment. For the 4th month in a row, another European manufacturer is offering U. S. firms patent rights on a direct sales basis or possible exclusive licensing arrangement for the manufacture of a new continuous ice making machine.

Most recent offer comes from one of the largest Italian manufacturers. Their machine reportedly produces ice in plates of 3- to 6-millimeter thicknesses, in tonnage capacities of 2½, 5, and 10 tons. Like other machines recently introduced, the Italian firm claims high utility value of their product to the fishing industry, having ability to manufacture salt ice from seawater.

Dual Recording Thermometer

PROCESS temperatures can be analyzed by means of a new dual recording thermometer marketed by a New York firm. Capable of sensing and recording temperatures simultaneously in two locations, the instrument is especially appropriate where critical temperatures may be required.



The model is equipped with two thermal sensing elements and two pen mechanisms in the same body. It is available in either electrical or spring driven chart drives. The charts are 10-in diameter. Ten scale ranges are applicable to this thermometer, and elements of the same scale range are interchangeable regardless of bulb type.

Low Temp Liquid Pump

INTRODUCED RECENTLY by a New Jersey firm, is a special pump for handling low temperature liquids such as LOXygen (nearly minus 300 F). The new pump is a standard by this old-line manufacturer, with special modifications which enable it to provide severe low temperature service.

Low temperature liquids are finding extensive use in both the military and the civilian facets of the modern industrial world. The principal military use of LOXygen is as an oxidizing agent for liquid fuels in missiles. The much broader civilian market employs liquid oxygen wherever oxygen itself is used*, e.g., in various phases of steel production.

For More Low Temperature Applications, See "Cold Traps" a short feature on Page 16.

Continuing "What's New"

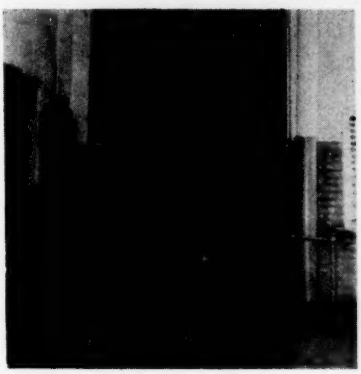
*See LOXYGEN, INDUSTRIAL REFRIGERATION, October 1958, Page 17.

Accessories

Flooring Material

BUILDING UPKEEP requires considerable attention of the plant supervisor or engineer as well as the refrigerating machinery. Recently West's Ice & Cold Storage Co. in Fond Du Lac, Wis. improved their plant traffic and sanitation by the application of water resistant materials.

Storage truck traffic had broken down a hard wood floor. The probable cause was the dripping water from fresh vegetables brought in for blast freezing, as well as water and frost from dairy products handled in the same area. Water had penetrated to the sub-flooring.

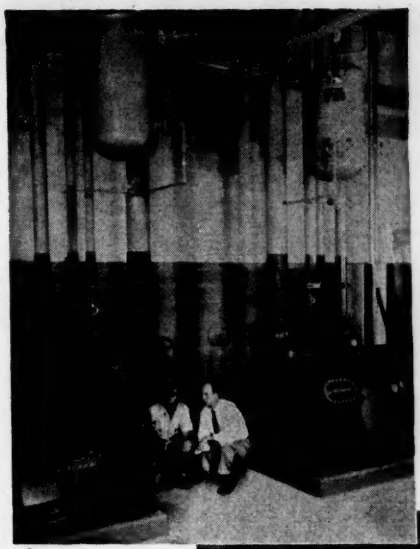


Mulsomastic was applied over the subflooring after the hardwood was removed to a thickness of 5/8-in. It was laid over felt and metal lath in areas of least traffic and over *Florsteel* where the traffic is heaviest. The work was done in the slack season by the firm's own men under the supervision of the manufacturer's representative.

Earlier a cold storage room with a wooden floor had been rendered water resistant by the use of *Tremco 103* and *Penetrem*. Similarly, a recommendation had resulted in a coating of the roof at this plant with *Tremco Roof Aluminizer* in 1953 which resulted in more efficient refrigeration operations. The reflective value of the roof treatment enhanced the insulation effectiveness.

Polarcote an enamel which resists asphalt "bleeding" is also produced by this firm, for finishing interior cold surfaces.

More on Page 8



View of the two, 8-cylinder, Vilter VMC ammonia compressors installed in the Pepsi-Cola Bottling Company's new Cincinnati plant. On the right is Mr. Albert M. Olsen, Chief Engineer.

..Bright! ..Light!
Have a Pepsi!

PEPSI-COLA®

BE RIGHT! BUY RIGHT!
BUY VILTER!

This new Pepsi-Cola Bottling Company plant houses three high-speed bottling lines capable of producing over 7,000,000 cases of Pepsi-Cola yearly.

"You can relax with Pepsi and with Vilter refrigeration,"

says Albert M. Olsen,
Chief Engineer of Pepsi-Cola's new Cincinnati plant.

No trouble, no down-time . . . just dependable day-in-day-out refrigeration —that's the Vilter story at Pepsi-Cola's modern new plant in Cincinnati. With Vilter compressors requiring little or no attention, a spotless plant is maintained—an exciting, sparkling show place for thousands of visitors.

The Vilter installation includes two 8-cylinder VMC ammonia compressors each producing 116 tons of refrigeration at 40° F. suction and 175° F. discharge. Three-step capacity control is provided—25%, 50%, 75%—for economical, efficient operation. These compressors provide refrigeration for two Carbo-Coolers where the water and syrup mixture is cooled and carbonated before being piped to the bottling line. The Carbo-Coolers run sixteen hours per day and cool 2981 gallons of mixture per hour to a temperature of 35° F. This demanding production schedule calls for reliable refrigeration.

The dependable performance of Vilter VMC compressors is the result of tireless engineering improvements: protection against refrigerant slugs, built-in capacity reduction; precision manufacturing techniques; painstaking inspection; careful assembly; and factory-run-in tests.

Why not call on your nearest Vilter Distributor for help with your refrigeration problem.

Sold and installed by Vilter Distributor, C. P. Wood & Co., Cincinnati, Ohio.

Write for helpful bulletin to The Vilter Manufacturing Company
Dept. H-812, 2217 South First Street
Milwaukee 7, Wisconsin

Bulletin 817
VILTER VMC
Ammonia Compressor

Vilter®
REFRIGERATION and AIR CONDITIONING

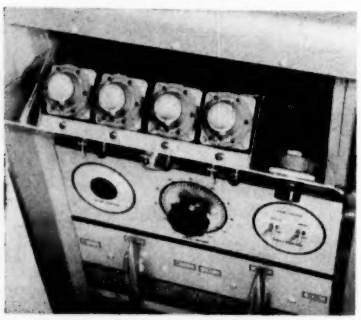
THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin
Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

WHAT'S NEW (Continued): Tools and Accessories

New Portable Welders

▶FIRST INTRODUCED at the Welding Machine Show last April, the *Magna-Tran* line of electric welding machines developed by a mid-states manufacturing company, are achieving considerable popularity in the production welding field, according to a recent sales report. Both ac and ac-dc machines are available in 300 or 200 amperes welding current with a 60 percent duty cycle, and also with a high, medium and low welding current range of 400 amperes.

Magnetically controlled, a patented transformer permits full range output by rotation of a single dial. High quality plug-in-type timing devices permit multi-purpose use by selection of up to 12 different operating control combinations. Switch settings for the combinations are located behind a tilting type panel in the unit as shown.



Little maintenance is required for this type of equipment. Nevertheless, the welders are designed with replaceable plug-in panels, timers and other components so that down time for repair has been all but eliminated. This concept of replacement which found popularity in aircraft production programs has been adopted as a standard replacement method in most automation programs.

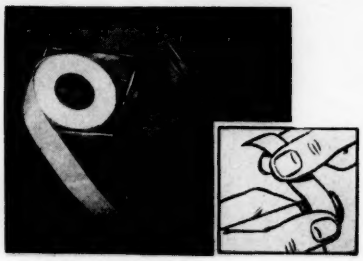
Portable Grinder

▶PORTABLE horizontal grinders and high speed die grinders are included in a new line of portable pneumatic tools by the manufacturers of *Torq-Air-Matic* equipment for industry. As pictured, the new horizontal grinders are applicable to a wide range of industry applications. Various sizes and models are available in sizes and speeds from 3- to 5000 rpm and wheel sizes from 3- to 8-in. in diameter.

High speed die grinders included in the new line have a wide range of uses in the machine shop or with the maintenance gang. Pictured, a die grinder with remote air exhaust is being used for a burr-removal on a cage slot.

Tape Type Pipe Sealer

▶PIPE joint compounds, home-made or of prepared formula, are probably on their way out. A new pipe joint sealer in tape form has been introduced by one of the packing companies which has long marketed a "pipe dope". Made from *Teflon*, the material is said to positively seal all types of threaded connections. It is recommended for Refrigerant 22 and holds promise for wider application in the refrigerant field.



Known as *Thred-Tape*, it can be used on plastic, aluminum, stainless steel, ceramic, synthetic rubber and carbon pipe. It prevents seizing and galling, is self-lubricating and allows connections to be drawn up to a greater degree of tightness. It never hardens, thus permitting easy disassembly of joints even after years of service.

New 95/5 Solder

▶SWIF 95, a 95/5 tin-antimony solder with active flux in paste form, is said to fill the need for a fast, economical solder for refrigeration and air conditioning applications where pressures up to 500 pounds are encountered.

The manufacturer claims that contractors have found the material costs less per joint due to the fact that four times as many joints may be sweated up with the new composition than ordinary 95/5 wire solder. The compound cleans, tins and solders in one operation.

Auto Refrigeration

▶COOL COMFORT for automobile travel can be achieved with a *Scott Aire* car refrigerator unit which uses water ice. These units introduced recently on the West Coast sell for about $70.00 a unit with an installation fee of from $10.00 to $15.00 in Southern California.

Unit was developed and tested in desert areas of the Western United States under the most severe heat conditions, and has proven operable in severe climatic conditions very favorably. Four models are marketed for all makes of American automobiles from 1954 through 1959. One model can even be adapted to the German made Volkswagen.

The units are easy to install being placed in the trunk of most models, except station wagons. Air is delivered through a plastic distributor which enters the car through the rear window deck. Air returns to the trunk via exits in the same deck. The unit operates on cracked or cubed ice obtainable at any vending station and delivers dry filtered refrigerated air by means of a two-speed circulating fan which operates off of 6-, 8-, or 12-volt system.

California commercial and industrial ice servicing stations have been helping promote the sale of these units and expect them to become popular throughout the United States, during the 1960 ice season.

A chest which contains cracked ice can double in service as a beverage cooler. For family travel it can maintain the baby's milk rations in fresh condition. Water is drained off from the unit by removing the drain plug from the tire well in the car trunk. Construction of the unit is such that other contents of the car trunk cannot be damaged by water or ice.

NEWS of MANUFACTURERS

Creamery Package To Sell Cleaver-Brooks Boilers

ANNOUNCED in mid-May was a working agreement between the Creamery Package Mfg. Company, Chicago, and the Cleaver-Brooks Company, Milwaukee, for the sale of Cleaver-Brooks *Monitor* package boilers to the dairy industry. The agreement is effective immediately with Creamery Package salesmen in effect becoming salesmen for the boilers. Cleaver-Brooks' own field force will work with the CP agents to provide sales and engineering assistance.

Cleaver-Brooks is claimed to be the originator of package boilers in the United States and the Creamery Package Mfg. Company is a national manufacturer and sales organization specialist in process equipment, refrigeration and supplies to the dairy and food industries. Spokesmen for the firm indicated that the addition of the boiler line is another step in the continued expansion of CP services to the dairy industry.

The *Monitor* is a specialty boiler suited to the dairy industry, which requires steam for sterilization, pasteurization, cleaning and related applications. The line is available in sizes from 15 to 60 hp.

Dow Reports on Tower Tests

EIGHT YEARS of study by the California Redwood Association to determine causes and means of preventing premature failure in California Redwood towers, has led to the conclusion that chlorine in the circulating water reacts chemically with the wood, rendering it more vulnerable to biological attack and earlier failure.

Product Information Service of the Dow Chemical Company, announced that non-oxidizing algaecides have been indicated as more effective in controlling micro-organisms while inhibiting wood rot. Two towers at Dow's Texas Division were included in the Associations 8-year tests. While the technical report on the test findings is not yet completed, Dow indicates preliminary results show that these non-oxidizing controls can also increase operational efficiency while reducing maintenance costs.

Tower Description, Operation

The two towers at Dow's Texas Division are used for cooling water in styrene production. They are similar to towers used at other Dow locations in power plant and production installations. When Texas test got under way, one tower had been in service 18 years.

When the older tower was put into operation in 1941, chlorine was used for biological control. In addition to initial dosage, shock treatments were required weekly. In spite of these measures, algae growth was virtually unaffected while the chlorine concentration in the water caused chemical deterioration of the wood, becoming a serious problem.

Also, algae built up to a thickness of 1-1/2 inches in a year's time on the tower's mist eliminators, which were untouched by the chlorine. This growth had to be removed by hand—a job that took five to six weeks for five laborers and two carpenters to complete. One result of this hand cleaning was breakage of approximately 10 percent of the redwood slats.

Report Due In Fall

Treatment with a specially formulated non-oxidizing algaecide was started in 1950 on the older tower after as much as possible of residual growth, organic and inorganic debris and sludge had been removed. This same treatment was started on the second tower when it was put into operation in 1950.

The technical report on test findings is scheduled for completion by early Fall and will include product information, operational data and maintenance cost comparisons.

Renewal Parts Depots Nationwide For York

ESTABLISHMENT of a nationwide network of renewal parts depots to serve owners of York engineered machinery was announced recently by Henry M. Haase, president. Each depot is an independent company, functioning as a wholesaler.

They are located and stocked to serve the parts' requirements of York's associates, independent contractors, service companies and industrial users. These depots are established to replace and improve the services of former York district and branch warehouses that have been discontinued. A total of 24 depots have been established.

Ehret, Baldwin-Hill Merge Organizations

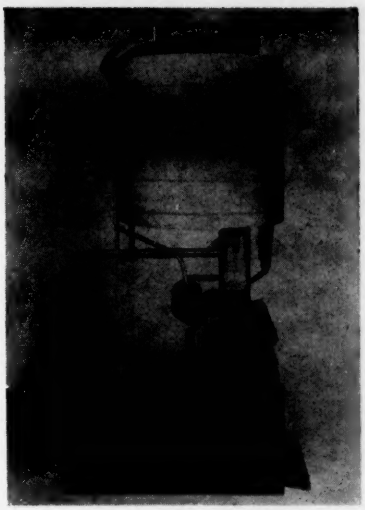
KNOWN AS Baldwin-Ehret-Hill, Inc., a new company with home offices in Trenton, N. J. has evolved from the merger between Ehret Magnesia Manufacturing Co., Valley Forge, Pa., and Baldwin-Hill Company of Trenton. The new company will become a major manufacturer of industrial and home insulations in addition to acoustical products. Customers will be offered a broad line of industrial insulations with a temperature range from minus 400 F to 2,000 F, from five plants throughout the country. Originally Ehret manufactured magnesia and calcium silicate insulations, and Baldwin-Hill manufactured heat and cold insulations and acoustical products.

New officers are: William H. Hill, chairman of the board; Alvin M. Ehret, Jr., president; Edward R. Stevens, executive vice-president; Henry H. Howell, Harold L. Humes and Miles M. Wilson, vice presidents; and William A. Schreyer, secretary-treasurer.

Australian Donates To Recold Museum

UNIQUE in that it is kerosene operated, an absorption refrigeration unit has been donated to the Recold Museum by Bert Terry of Melbourne, Australia. This unusual example of pioneer refrigeration equipment was designed for use in remote areas not served by gas or electricity, and where a source of cooling water was not available.

Ammonia is evaporated by heat from two kerosene burners and during the heating cycle ammonia vapor is condensed in coils located in the large water filled drum at the top of the unit. Liquid ammonia then drains into the evaporator where it collects.



At the end of the heating cycle the weak solution in the generator begins to reabsorb ammonia vapors from the evaporator and when all ammonia is evaporated the heating cycle is repeated. An interesting feature of this unit is the small fuel tank that holds just enough fuel for one heating cycle. Each time the cycle is repeated the tank must be refilled.

Water-cooled Electrolux

WHILE the Australian contribution to the museum was announced in May, earlier H. T. (Hy) Jarvis, founder of the museum, announced that a rare model of a water-cooled Electrolux refrigerator had been donated to the museum by Harold McQuay of Los Angeles. The water-cooled unit was only manufactured for about two years. These Electrolux, later called Servel, gas refrigerators used continuous cycle ammonia absorption units.

Research Building

PRODUCERS of refrigeration and air conditioning condensers, the Karmazin Products Corp. of Wyandotte, Mich. is now located in a new research and office building, according to a recent issue of THE DETROITER.

PERSONS IN THE NEWS: Businessmen, Engineers, Manufacturers

A. W. Cox

D. F. Sahler

J. L. Adams

K. Baumler

R. Levin

Dayton Rubber Coordinates Urethane Insulation Sales

APPOINTMENT of **Allan W. Cox** as director of urethane product sales for The Dayton Rubber Company was announced in August by **C. M. Christie,** president. Cox will coordinate all urethane product sales of all divisions with exception of pillows and furniture, Christi said. "The tremendous growth of the urethane market cuts across divisional lines, makes this position necessary".

Cox will coordinate Dayton Rubber's expanding eastern urethane marketing activities with those of American Latex Products Corp. in Hawthorne, Calif. The latter firm, a wholly owned subsidiary, is the leading foam rubber and urethane producer on the West Coast. Dayton Rubber and its subsidiaries are leading producers of urethanes in all three basic forms; flexible, rigid and solid. In Hawthorne, Calif. the company recently established modern laboratories designed specifically for basic urethane research.

With more than 23 years experience in the industrial insulation field, Cox has a broad background in sales, market research and product development in field sales as well as contracting. He was a district manager with the Cork Insulation Company, Inc., and with the Owens Corning Fiberglas Corporation as manager of commercial and light industrial insulation sales and manager of low temperature insulation sales.

Manufacturing Manager

NEWLY CREATED at the Pittsburgh Corning Corp., is the position, manager of manufacturing. Appointed to that position is **Karl Baumler,** according to a recent announcement by **Russell Brittingham,** president. He will direct the manufacturing activities of the two Pittsburgh Corning plants at Sedalia, Mo. and Port Allegany, Pa., as well as preparing manufacturing facilities for a future company expansion.

Mr. Baumler joined Pittsburgh Corning in 1948. He has successfully held supervising or production managing positions in various plants in the two cities mentioned, prior to this appointment. Most recently he was works manager at the Sedalia plant where he has been succeeded by **L. O. Griffith, Jr. E. G. Merry** will replace Griffith as production manager.

Sporlan Increases Field Staff

EXPANDING its service to customers, Sporlan Valve Company announced the appointment of **John L. Adams** and **David F. Sahler** to field sales offices. Adams will work out of the Atlanta office, headed by **D. M. Lawson,** while Sahler will work with **J. J. Mays** who is in charge of the Dallas office.

Both additions have been former members of Sporlan's engineering department and are thoroughly schooled in refrigeration and air conditioning. Adams, a native of California has a B.S. in Engineering from California State Polytechnic College, San Luis Obispo, Calif. Sahler, formerly a resident of New York State, is a graduate of the University of Rochester, N. Y.

Armstrong Cork Adds To International Division

NEWLY created at Armstrong Cork Co.'s International Operations, is the position of assistant general products manager. **Harold H. Borthwick,** the company's senior patent agent has been named to the new post according to an August press release by **I. Wayne Keller,** general manager. Borthwick will assist **E. E. Myers,** general products expansion of present overseas production facilities, the addition of new units and addition of various patents and licenses.

Manufacturing Engineer

APPOINTED manufacturing engineer at Kohlenberger Engineering Corp., is **Ralph Levin.** A UCLA engineering graduate, Levin had previously graduated from the California Maritime Academy, served for 8 years as research and development supervisor with Sterling Electric Motors and most recently was associated with the Mullenbach Division of Electric Machinery Mfg. Company. The announcement was made by **C. R. Kohlenberger,** president of the Fullerton industrial refrigeration concern.

Dunham-Bush Appointments

NEW PRODUCT manager for air conditioning at Dunham-Bush, Inc. is **Frank D. Klein.** He will be located in the main office at West Hartford. **E. Harold Brown** has been appointed field sales engineer, covering the Buffalo, N.Y. area and will be assigned to the Cleveland District Office, according to sales vice-president **James A. Mulcahey.**

Author W. H. Motz Passes

Wrote *Principles of Refrigeration*

MECHANICAL ENGINEER Wm. H. Motz, author of PRINCIPLES OF REFRIGERATION, published originally in 1926, passed away as a result of a stroke on Sunday, August 9. Motz had been supervising engineer for Jefferson Ice Co., Chicago. He was 66 years old.

A professional engineer, he had had an extensive experience as a refrigeration engineer and teacher. During his practice with manufacturers of ice making and refrigerating machinery, and in his instruction work with the Ohio Mechanics Institute, Cincinnati, the University Extension Division, University of Wisconsin, Madison, Siebel Institute of Technology, Chicago, and the Chicago Chapter, NAPRE, Motz had collected considerable material which was incorporated in his book.

Object of the "Principles" was the presentation of elementary and fundamental principles underlying the operation of ice making and refrigeration machinery, according to Motz. His intention was to produce a book useful to beginners in the study of refrigeration and as a text for students in technical schools, and to provide information and data for the practical refrigeration engineer. Even though the book has been out of print in recent years, there have been many requests for the text.

The late Mr. Motz had been associated in his practical instruction with such other figures, as the late E. S. Libby, Professor of Refrigeration, Armour Institute of Technology, Chicago, and the late H. G. Venemann, Professor of Refrigeration, Purdue University, Lafayette, Ind. Since 1942, Wm. Motz had headed up the Educational Committee, PREA, Chicago. He had also been Technical Editor, ICE AND REFRIGERATION at one time.

Ice Pioneer Passes

RETIRED pioneer utility operator in Olney, Virginia, **Harvey L. East** died July 20 at his home there. Olney's first electric lighting system and ice plant was established by East and operated by him for many years before it was acquired by the Eastern Shore Public Service Co. He was 81 years of age.

(Continued on Page 38)

Transportation 'n' Terminals:

TTMA Trailer Rating Initiated At Budd

▶▶ FORMALLY APPROVED as a first independent test laboratory for refrigerated trailers is the Budd Co.'s test facility at Philadelphia. The announcement was made by C. W. Alexander, president, The Truck-Trailer Manufacturers Association, at its 11th Annual Summer Meeting, 1959.

Cooperative study and research by TTMA, USDA, and NBS, has developed a practical and reliable method of testing refrigerator efficiency of truck trailers transporting frozen foods over the highways. Truck-Trailer Rating Program has been financially supported by the American Trucking Associations, Inc., the Common Carriers Conference—Irregular Route, and TTMA, in half; the government agencies, the other half.

Libby Adds Two Reefers

▶▶ LIBBY, MCNEILL & LIBBY added two 40-ft insulated trailers and diesel tractors to their reefer fleet in August, according to THE SCANNER. Based at Libby's Sunnyvale, California plant, the two units are said to be 45,000-lb capacity, with the largest refrigeration units manufactured. They will transport frozen foods between Libby plants and cold storages in California and the Northwest.

United Flight Kitchens

▶▶ AVERAGING 3,000 meals daily but with capacity to 6,000, United Airlines earlier this year opened a new flight kitchen at San Francisco. Featuring closed circuit television among other advanced equipment for maximum culinary efficiency, other innovations include automatically operated transparent doors for the walk-in refrigerators. Stores, refrigerated and dry, are palletized operations. Another new kitchen is planned for Chicago, Ill., making 15 in all for United.

Lamb-Weston Doubles Up

▶▶ COLD STORAGE facilities of Lamb-Weston, Inc., were doubled early in July when the new warehouse was completed at Weston, Ore. The McCormack Construction Co., Pendleton, Ore. built the 125x650-ft. warehouse in 74 days on a 90-day completion contract. The longer side embraces a 16-foot covered dock.

Icing And Pre-Cooling

▶▶ PRE-COOLING of potato cars is considered a market aid by the Bangor and Aroostook Railroad Co. On July 10 they finished their second year of free pre-cooling potatoes. Over 1800 cars were iced in this second year service designed to compete with new California potatoes coming into Eastern markets May to July.

Shipments from California and Arizona during the first week of June totaled almost 1900 carloads, an increase of almost 27 percent over 1958 shipments, according to the NIA. Estimates indicate that the increase continued in the Southeastern states in late June and early July, having a tremendous uptrend in the water ice rail movement of perishables.

Predictions of Storage In Transit

▶▶ NARW COLD FACTS in August 12 reviewed an article from the June issue of MODERN MATERIALS HANDLING which predicts the development of storage-in-transit systems. Basis for this speculation was the use of tankers transporting many liquid and semi-liquid products, such as the winery tanker operating intercoastal from California vineyards, and the orange juice bulk carrier operating from Florida to New York.

There has been some speculation of extending the orange juice service through the St. Lawrence Seaway to such ports as Cleveland, Toledo, Detroit, Milwaukee and Chicago. The S. S. Tropicana, an 8,000 ton cargo vessel carries fresh fruit orange juice to New York, vacuum sealed in stainless steel tanks which are refrigerated.

Fruit Industries Inc. operates the tanker between Port Canaveral and Bradenton, Fla. to Whitestone, Long Island, New York. A number of tractor-tanker-trailers are operated by this firm and others to a number of northern cities at the present time in similar service.

NPRR Produce Terminal

▶▶ REPLACING existing produce handling facilities in Seattle will be a new half million dollar produce terminal constructed by Northern Pacific Railway. Occupying an area 80x480-ft, the new market is located outside of the congested metropolitan area. The old facilities in the Commission Block will be razed for a parking lot.

Purchases, Conversions In Railroad Reefers

▶▶ MID-YEAR REPORT by the Association of American Railroads and the American Railway Car Institute showed an additional 700 refrigerator cars ordered in June. There were none built during that month, however, and 2385 items of refrigerated rolling equipment remains on order or undelivered.

▶ Santa Fe placed orders for 200 new mechanical refrigerator cars at a cost in excess of $5 million dollars early in July. Half of the cars will be delivered by General American Transportation Corp. and the balance by Santa Fe at West Wichita, Kansas.

▶ At C & O Railway shops, that firm starts work in September on the conversion of 75 40-ft cars into insulated compartmentizer refrigerator cars with plug type doors. This is in addition to 50 similar cars purchased earlier from ACL.

PFE Adds Over 1000

▶ Early in August, Charles V. Ahern, vice-president and general manager, Pacific Fruit Express Co. announced plans to construct 1,025 multi-purpose mechanical refrigerator cars. Estimated cost is $27 million dollars. Deliveries are scheduled to begin in February 1960, with completion in September 1960.

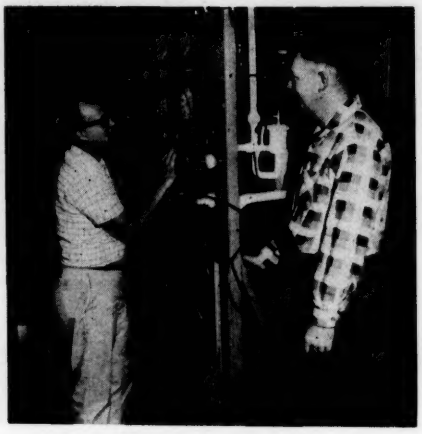
According to the WALL STREET JOURNAL, all but 25 of the cars will be 50-ft long, 60-tons capacity, with mechanical refrigeration units capable of 0 to 70 F temperatures, the remaining 25 to be designed for commodities requiring temperatures between 32 and 70 F. All cars will be of the 20-day operational variety; i.e. capable of 20-days service without refueling.

According to LOS ANGELES TIMES, which covered the same release from Ahern, this subsidiary of the Union Pacific & Southern Pacific Railroads, already owns the largest number of mechanical refrigerator cars, which figure they place in excess of 2700. Water-ice cars operated by this firm in addition to their mechanical cars, number approximately 31,000.

Armour Overhauls Cars

▶ Announced at the same time as the PFE plans, was a $450,000 contract which the Minneapolis and St. Louis Railway negotiated to repair 200 Armour & Co. refrigerator cars. This work, according to the JOURNAL staff reporter was to be done at the railroad's Marshalltown, Iowa car shops, and got under way early in August. It was estimated that the job would require six months.

HELIUM LIQUEFACTION AND TRANSPORTATION



Helium liquefier, designed by the Cryogenic Engineering Laboratory of the National Bureau of Standards Boulder (Colo.) Laboratories, is one-tenth the size of that proposed for the Navy Bureau of Aeronautics. D. B. Mann (left), liquid helium project leader, designed the liquefaction process equipment. B. W. Birmingham (right), Assistant Chief of the Cryogenic Engineering Laboratory, carried out studies of the feasibility of helium liquefaction and transportation at or near its liquid density.

▶▶▶TRANSPORTING HELIUM over long distances in liquid form is a practical feasability. This was learned from recent studies at the Boulder (Colo.) Laboratories, National Bureau of Standards, made for the U. S. Navy Bureau of Aeronautics. Conducted by D. B. Mann and B. W. Birmingham of NBS's Cryogenic Engineering Laboratory, the study reveals that large-scale liquefaction plants and liquid distribution systems compare favorably with compressed gas systems as a means of transportation, when quantities and distances are sufficiently great.

The current importance of helium to national defense and to both basic and applied research, has focussed attention on the cost of its transportation. For large users, such as the Navy, liquefaction and transportation of helium at or near its liquid density will lower gas costs by reducing shipping charges. This procedure will also facilitate distribution.

U. S. Helium Sources Limited, Applications Multi-Expanding

Helium gas is obtained from natural gas mixtures in the West Texas area, where it occurs in concentrations of up to eight percent. At present, distribution of the extracted and purified gas from production plants to consumers requires the use of extremely heavy, high-pressure, cylinder tank cars having a limited gas capacity. Transportation costs are therefore an appreciable percentage of the total cost of the gas delivered to the consumer.

Both private and government research since World War II has extended the number of uses for helium demand. Today consumption is 600 percent greater than it was a decade ago. Until the war years, the primary application of helium was the lighter-than-air craft operations of the Navy. Although this use still represents a considerable percentage of the total helium consumption, other military and civilian users have been making larger and larger inroads into the supply of helium. Department of Defense requirements alone have outstripped liberal estimates. At present, rocketry, shielded arc welding, weather balloons for routine and research aerological activities, nuclear reactors, aeronautical research, and low temperature (cryogenic) investigations are the chief applications.

Low Liquid Yields

Liquefaction of helium, first accomplished by Onnes at the University of Leiden in 1908, is rapidly becoming a common cryogenic technique. Basically, the process of reaching low temperatures (close to absolute zero) is similar to that used in producing ordinary refrigerator temperatures. Compression of purified helium gas to a pressure of 220 psi yields about 10 percent liquid, when suitably precooled and expanded.

The solution which helium liquefaction offers for transportation difficulties led CEL to undertake the design of suitable liquefaction facilities and transportable containers. This program calls for location of the facilities close to a helium production plant for the greatest economy.

Hydrogen Hazards Removed

Process simplicity and ease of operation are of primary importance in planning the initial facility. The process recommended employs work-producing expansion engines, and requires the use of liquid nitrogen or liquid air as pre-coolants to produce the necessary refrigeration. In this way, pre-cooling by liquid hydrogen with its accompanying hazards is eliminated and operational complexity is reduced. Another desirable result is greater cycle efficiency.

Pressure Differentials In Excess of 2300 psi

The operation suggested is a simple Claude-type cycle which consists of one expansion engine operating at a temperature below that of a liquid nitrogen pre-coolant bath. A modification, made possible by a 155-atmosphere pressure differential, employs a second expansion engine in the helium-feed gas stream for the conservation of the liquid nitrogen refrigerant. The pressure of the helium feed from the production plant is 170 atmospheres while the operating pressure of the liquefier is only 15 atmospheres.

Liquid, Powder Insulations

Pipe lines insulated and shielded with liquid nitrogen or liquid air make possible the efficient transfer of helium from the liquefier to transportable containers. The containers designed by CEL are of a conventional liquid-nitrogen shielded, three-shell construction with evacuated powder as insulation. A new insulation, recently reported by private industry, has a thermal conductivity low enough to eliminate the need for liquid nitrogen shielding.

Vessel Specifications

During transportation, isolation of the container allows the pressure to rise to some fixed design value based on travel time and rate of heat transfer, accomplishing "no-loss" storage. For example, newly designed tank cars call for an inner helium vessel capable of withstanding a 10-atmosphere pressure rise within a 10- to 15-day period. This is adequate for transportation within the continental United States. Stainless steel meets the requirements for the pressure vessel. Carbon steel or aluminum are the preferred metals for the outer ambient-temperature vessel.

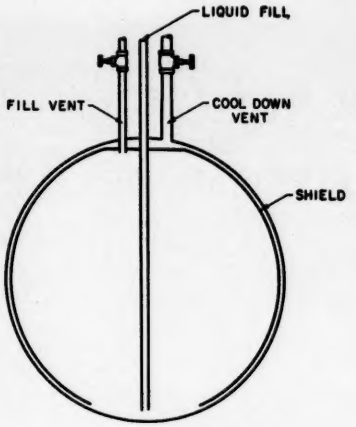


Fig. 1. Container designed by Boulder, Colo., to decrease by a factor of ten the amount of helium (liquid) required in the "cool-down."

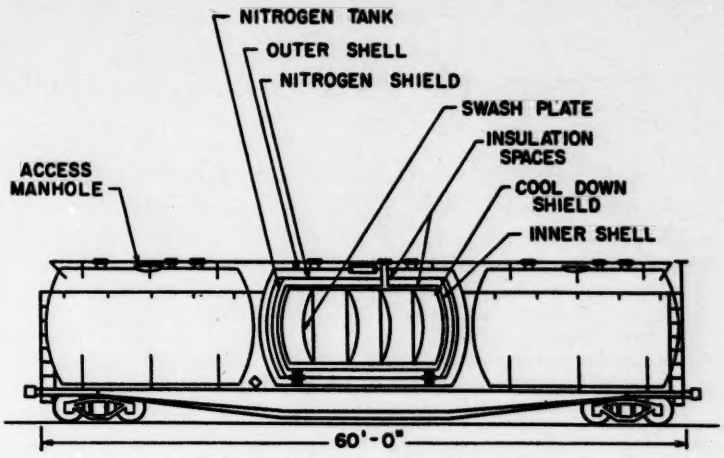


Fig. 2. Insulated rail tank car, 13,000-gallon capacity, designed by the Cryogenic Engineering Laboratories of the National Bureau of Standards Boulder (Colo.) Laboratories for large-scale transportation of helium at its liquid density.

Upon arrival at a specific destination, helium must be transferred into compressed storage facilities; it cannot be kept indefinitely at low temperature without refrigeration. Two methods are proposed for this transfer: (1) If an adequate pressure is maintained in the container, helium can be forced through a heat exchanger, warmed to ambient temperature, and then piped to gas storage cylinders through conventional compression equipment; or (2) a low-temperature pump can be used to force the helium through a heat exchanger to compressed-gas storage.

The thermodynamic problems encountered in this proposed program of helium liquefaction and transportation have received considerable attention. Two of these problems are: (1) Reducing the amount of liquid helium required to cool the storage vessel and (2) eliminating temperature stratification of helium in the container.

Self-Cooling Feature

The "cool-down" of equipment in which liquid helium is the only refrigerant is wasteful because of helium's low heat of vaporization. To reduce this waste, a well-known cryogenic technique was adopted so that a portion of the sensible heat of the cold helium gas that has been vaporized during the initial stages of the "cool-down" could be utilized. This was accomplished by incorporating a concentric shell inside the helium pressure vessel to channel the evaporated helium between the vessel and pressure shell (see Fig. 1). This design decreases the amount of liquid helium required for cooling by a factor of ten.

An operational solution for the second problem is not, as yet, available.

Production, Transit Results

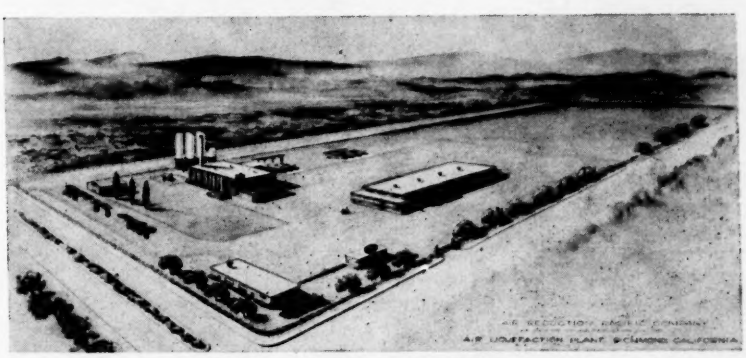
The specific design resulting from this study will fulfill Navy requirements for a liquefaction facility capable of condensing helium and delivering it to storage at a rate of 50 gal per hour. The liquefied gas will be transported by insulated rail tank car having a capacity of approximately 13,000 gal. (see Fig. 2).

Interest of other large consumers, stimulated by the economic and technical feasibility of the accepted design, has extended the studies to the design of liquefaction facilities with an hourly rate of 260 gal. Truck-trailers with capacities to 6,000 gal have been proposed for the transportation of less-than-carload quantities.

Small quantities of liquid helium are now also air-shipped in the United States. During the last six months, CEL has shipped 12.5- and 19-gal helium containers to a destination about 2,000 miles from the liquefaction source. Four to five shipments per month have been made by commercial air lines. The only special precaution necessary is a check valve on the normal vent line. This prevents air from being drawn into the liquid helium space by changes in atmospheric pressure. Losses during a typical shipment of this kind are less than one-quarter gal.

If large-scale helium liquefaction becomes a reality, many research programs will benefit from a much lower cost of the liquid. This would reduce the cost of such studies as cooled, solid-state MASERS (Microwave Amplification by Stimulated Emission of Radiation) and cryotron computers. The MASERS are vital to scientific progress in radio astronomy, and the cryotrons may make possible much more compact computers than are currently available.

Airco Pacific Building Liquid Oxygen Plant



▶ Air Reduction Pacific Co., a division of Air Reduction Co., Inc., has under construction a new $3,000,000 liquid oxygen, nitrogen and argon plant in Richmond, California. The new plant, to produce 30 tons of liquid products daily, will largely serve missiles, metalworking and steel industries in the San Francisco Bay area. Completion of the plant is expected late in 1959.

Cryogenic Conference Held In California

University of California, Berkeley, Host To 1959 Meeting

▶▶▶NATIONAL Cryogenic Engineering Conference for 1959 will be held in the University of California in Berkeley, September 2, 3, and 4. Emphasis this year is on cryogenics in the missile field, and the importance of super insulation. The latter will receive special attention in a panel discussion by leading experts.

Secretary of the Cryogenic Engineering Conference, K. D. Timmerhaus, indicated that the move to the West Coast for this conference is prompted in part by the large concentration of missile activities there. The University of California was selected as the setting as it was there that much early work was done in cryogenics. Dr. D. N. Lyon, Professor of Chemistry, Low Temperature Laboratory, U of C, is Chairman of the Conference Committee.

First session of the conference covered Application and Techniques. Dr. S. C. Collins, M.I.T. presided. Second session featured twin presentations, one on Missile Technology and the companion session on Insulation. R. W. Vance, Space Technology Laboratories, Inc., presided over the former and G. J. VanWylen, University of Michigan, over the latter session.

Third session dealt with Super Insulation, with R. B. Scott of the Cryogenic Engineering Laboratory, NBS, presiding. The 4th, 5th and 6th sessions were all parallel sessions covering Heat Transfer, Design and Application, Liquefaction and Refrigeration, Mechanical Properties, Fluid Phenomena, and Processes and Data.

Cooling Magnetrons

In the Applications and Technique session, two papers were presented on large cryogenic magnet coils for nuclear physics applications. One paper dealt with the possible uses of large coils operated at low temperatures, while the other dealt with questions of cooling cycles, heat transfer and thermal stability of mechanical reinforcements. (For a brief description of how refrigeration is used, see INDUSTRIAL REFRIGERATION cover and page 27, October 1958).

The same session had a paper presented on a 72-in. liquid hydrogen bubble chamber, by H. P. Hernandez of the University of California. He covered the refrigeration load and liquid nitrogen consumption of the bubble chamber. Other papers dealt with the handling and storage of liquid hydrogen and helium, and the test equipment and procedures used in liquid oxygen-hydrogen rocket engines.

One paper presented a review of the efficient manufacture of tonnage liquid hydrogen from conventional gaseous sources. Large scale manufacture of refrigeration and successful applications were described and analyzed. It included low level refrigeration by hydrogen turbo expanders. Transfer and storage systems were outlined in detail. The talk was by P. Vander Arend, Air Products, Inc.

Cryogenic Transportation

W. E. Perkins and R. J. Frainier of Linde Company discussed the storage and distribution equipment of a practical commercial nature for the shipment of liquid hydrogen and helium. Typical designs were presented for the transport, storage and process piping. The advent of superinsulations, according to these authors has eliminated the need for auxiliary refrigerants.

Insulation Importance

Even the session on missile technology developed a large number of refrigeration installations and allied problems. In a paper on cryogenics for space flight applications, D. G. Driscoll of Linde Company, indicated that lightest weight storage containers utilizing high efficiency insulations are needed. Insulation casings for large propellant tanks may be integrated into the skin of a vehicle, or stripped from the vehicle immediately prior to launching.

Of interest to many refrigeration engineers would be the paper by three CEL, NBS, experts on the Transfer of Liquid Hydrogen Through Uninsulated Lines. In another paper W. G. Flieder and W. J. Smith of A. D. Little, Inc., discussed Flexibility Considerations for the Design of Large Diameter Cryogenic Transfer Lines. An abstract of this paper printed in the Cryogenic Engineering Conference program stated that "The military operational requirement for the Atlas missile dictated that **liquid oxygen be supplied to the missile from two closely coupled storage tanks through 12-in. diam. transfer tubes.**

In many respects the arrangement of the piping is similar to conventional chemical process piping systems. Thermal flexibility, however, could not be obtained by the use of standard techniques, e.g., expansion loops, because of limitations imposed by space and piping cooldown weight.

Piping Problems

Bowing takes place in a pipe that is partly filled. In a partly-filled pipe the upper circumference is almost at ambient temperature, while the submerged portion is at a liquid temperature. As a result the pipe tends to arc. Vertical displacements of several feet have been observed in 100-foot long transfer lines at test facilities. Most severe bowing takes place when the pipe is half filled.

Bonded Panel Insulations

The insulation session dealt with Externally Bonded and Sealed Sandwich Insulations, Flat Panel Vacuum Thermal Insulation, Evacuated Powder Insulation, Condensation Problems, Low Temperature Insulating Systems, Radiation Shielding Techniques and Multiple Layer Insulation. V. H. Gray, National Aeronautics and Space Administration, told the cryogenic conference that for a particular vehicle configuration considered, the over-all thermal conductivity of a honeycomb sandwich is about three times better than that for loose, fibrous insulation but the weight is about four times as much. This conclusion resulted from a series of tests on liquid hydrogen and oxygen tanks, and culminated in an insulation-filled honeycomb sandwich bonded to the tanks and sealed internally and externally with reinforced plastic laminates.

H. M. Strong, General Electric, related how evacuated mats of glass fiber, made up of fibers of proper size and orientation are capable of supporting a compressive mechanical loading of at least one atmosphere. The use of such a glass fiber mat as a filler makes possible an evacuated flat panel thermal insulation which is comparable to a dewar flask in insulation efficiency. Dewar flask structures can themselves be phenomenally improved through the use of oriented glass fiber mats in series with one or more radiation gaps.

Metal Powder Insulation

A paper by four scientists at CEL, NBS, indicated that Evacuated Powder Insulation was efficient for cryogenic temperatures. Finely divided powders of aluminum, copper, nickel, and silver have been investigated. The smallest metal powders used (less than 44 microns) are the most effective in reducing the thermal conductivity.

As most practical refrigeration engineers could tell the cryogenic experts and scientists, vapor condensation within the insulation appears to be as much a problem in the low temperature field as it is in the relatively higher temperature refrigeration applications such as in food preservation, brewing, etc. However, at low temperatures these problems are greatly magnified and various laboratories undertook the studies of filling annular space around liquid lines and cryogenic facilities with liquid air, carbon dioxide, etc.

According to D. A. Van Gundy, CEL, NBS, storage life is increased by filling the annular space surrounding the liquid line to a positive pressure with a condensible such as carbon dioxide. This insures no inward leakage of air while the line is not in use. The liquid line must be wrapped with a porous material so that the fragile solid condensible will be mechanically held and not fall to warm parts of the line and re-evaporate to ruin the insulating vacuum.

Vacuum Insulations

Multiple Layer Insulation was covered in three papers by Owens Corning Fiberglas Corp. representatives who reported on new findings for glass fiber insulations under vacuum. Various insulating systems were tested and reported on, all being composed of reflective septa supported by glass fiber.

On the same subject three scientists of A. D. Little, Inc., reported on the use of commercially available material in combination of variety of spacers—such as glass fiber, nylon, glass wool and others. Three representatives of CEL, NBS, discussed a new development on cryogenic insulation which consists of alternating layers of poor conductors and good reflectors. The report indicated that this method is about ten times more efficient than the best evacuated powder insulation. They were of the opinion this type of insulation would be especially advantageous where payload is very important; for example, the transport of liquid helium or hydrogen.

Evacuated Foam Materials

Even the Design and Application session *got into the subject of insulation*. One paper by L. R. Stoecker, Beech Aircraft Corp., was on the subject of evacuating plastic forms to reduce their thermal conductivity. The abstract on Stoecker's talk reads:

"Over the past years, the use of plastic foam as an insulator has met with wide acceptance. More recently plastic foams have been employed as insulations in numerous cryogenic applications. There has, however, been very little improvement in the thermal conductivity of these foams since their inception. Realizing the potential of plastic foam as an airborn cryogenic tank insulator a program was initiated to devise a method of lowering the thermal conductivity coefficient of this type of insulation. It was believed that if this could be achieved, a substantial savings could be made in the insulation weight.

Practice Upsets Theory

"The approach to the problem was not chemical in nature in that no new formulations were attempted. It was, instead, a mechanical process that involved the removal of the residual gases within the individual cells of the foam, even though the cells were thought to be fully closed.

"Sufficient tests were conducted in a cylindrical cryostat to establish the fact that the apparent mean thermal conductivity of some of the foams could be reduced to a value that is one-third to one-half that of ordinary unevacuated plastic foams."

Low-Temp Pumping

However, other session papers dealt with high pressure pumps for handling liquid hydrogen and helium. The paper by C. F. Gottzmann, Linde Company, dealt primarily with the problems that arise because of the unusual properties of liquid hydrogen and liquid helium, such as low viscosity, low latent heat per unit volume, and high compressibility. Attention is devoted to questions of plunger sealing, plunger friction, design of pumping chambers and valves, heat leak and material selection.

In another paper by D. S. Harris, Boeing Airplane Co., cryogenic systems for some future aircraft was discussed as being more than just breathing systems. Mixtures of O_2-N_2 will be used to cool equipment or men, pressurize the pilot's suit or compartment, and provide a breathable atmosphere. The results of the tests, Harris told the Cryogenic Conference, show that a "shirt sleeve" cabin can be maintained. (The Garrett Corporation, AiResearch Manufacturing Div., already showed their concept in pressurization and cooling by means of cryogenic systems, in national advertising in August).

Special Compression Systems

In the Liquefaction and Refrigeration session, attendants at the Berkeley meeting learned how a Joule-Thomson regenerative cryostat and a hydraulically driven diaphragm compressor are combined to produce a temperature of minus 175 C at the sensing element in an infrared detector (with Maser amplifiers).

In another paper by three representatives of Air Products, Inc., some of these miniature Joule-Thomson Refrigeration Systems were discussed. The use of air-borne surveillance systems which are sensitive to very long wave length infrared radiation, their paper said, is dependent upon the availability of miniature cryostats operating at different temperatures for various semi-conductor detecting elements. Other technical developments are also dependent upon the availability of small, closed cycle refrigeration systems. The range of temperatures of interest is from about minus 457 F to minus 100 F.

The selection of Joule-Thompson refrigeration systems as the immediate solution to the above problems is based on the reliability of these systems which operate without moving parts. Comparisons are made, based on thermodynamic and equipment considerations, of the specific advantages and disadvantages of alternate refrigerants, such as argon and nitrogen, which can be used in the same general temperature range. Several designs for heat exchangers including the design of compact, cascade heat exchangers for multi-refrigerant systems were described. Heat transfer data on the performance of these exchangers was presented.

Natural Gas Liquefaction

There is presently, intense interest in the liquefaction of natural gas, said J. DeLury, J. F. Pritchard and Co., in his presentation. Liquid methane has already been moved from Louisiana to England by tanker. If this venture proves successful, a world wide commerce may result. Gas utilities are considering liquefying surplus gas during summer, storing the liquid at atmospheric pressure, and revaporizing it in winter to supplement pipeline deliveries during period of peak demand (See "Propane Refrigerates Propane," INDUSTRIAL REFRIGERATION, August 1959).

. . . More

The large scale liquefaction of natural gas presents a number of specialized process and mechanical design problems. Among these are removal of acid gases, water vapor, and non-condensibles, liquid transfer and storage. Since gas compositions vary considerably, this is an important consideration. The choice of an economic liquefaction cycle is dependent on a number of factors among which are capacity of plant and location. This paper discussed developments in the liquefaction of natural gas. The design of a large scale liquefaction unit was described.

Cryogenic Data Center

V. J. Johnson, CEL, NBS, described how technical literature and engineering data of interest to people working in the cryogenic engineering field has been published or distributed in literally thousands of different periodicals, books, government reports and private publications. The Data Center staff at the NBS Cryogenic Engineering Laboratory is endeavoring to index as much of the world's cryogenic literature as possible and store the references for easy retrieval.

The present manual system of coding literature and sorting references is discussed. Plans are outlined for converting to the machine storage and sorting necessary to make the Data Center service generally available to the cryogenic industry.

Committee Members, Sponsors

The 1959 Cryogenic Engineering Conference Committee under Dr. Lyon included F. J. Edeskuty, Los Alamos Scientific Laboratory; R. B. Jacobs, National Bureau of Standards, L. Nesbitt, General Electric; K. D. Timmerhaus, NBS, University of Colorado; C. J. Tonjes, Jr., Roman and Kunzl, Inc., and R. S. Warner, Jr., Advanced Research Projects Agency, Office of the Secretary of Defense.

The Cryogenic Engineering Conference was made possible by these firms: L'Air Liquide, Air Products, Inc., Air Reduction Co., Allison Division, General Motors, American Messer Corp., Aro Equipment Corp., Bechtel Corp., Beech Aircraft Corp., Convair, Garrett Corp., General Electric Co., Hydrocarbon Research, Inc., Linde Co., A. D. Little, Inc., The Martin Co., National Bureau of Standards, North American Phillips Company, Inc., Northrop Aircraft, Pesco Products Div., Borg-Warner Corp. Roman and Kunzl, Inc., Ramo-Wooldridge Corp., Stearns-Roger Manufacturing Co., Superior Air Products, Inc., Thompson Products, Turbocraft Co., United Aircraft, Westinghouse Electric Corp.

COLD TRAPS SOLVE MOISTURE PROBLEMS

Two-stage chilling machine at left cools the main trap, capturing stray vapors and preventing their contamination of the particle acceleration tube in the 2-million electron-volt Van de Graaff electron accelerator at High Voltage Engineering Corporation, Burlington, Mass.

—Photo Courtesy of Harris Refrigeration Co.

▶▶ MECHANICALLY REFRIGERATED COLD TRAPS, maintaining temperatures of minus 120 to minus 150 F., are paying for themselves in as little as several months where they are replacing dry ice or liquid nitrogen to remove moisture in creating a vacuum. Although the latter materials can attain temperatures as low as minus 300 F., their effectiveness is rapidly impaired as the expendable refrigerating materials are depleted.

Mechanical cold traps have proved more efficient by maintaining constant low temperatures and applying it right at the point where it is most effective. In addition, they eliminate both the expense and the labor of continuously replenishing the temporary refrigerating materials.

Help Nuclear Science

In proton and electron accelerators, such as the cyclotrons at the University of California and Harvard, mechanically refrigerated cold traps are used to prevent introduction of stray vapors into the particle acceleration tube. The High Voltage Engineering Corporation at Burlington, Massachusetts, also employs a refrigeration unit in their radiation-processing vault, as shown above.

According to L. E. Wilson, Engineer directing the installation of the chiller in the Van de Graaff electron-beam processing facility, "The chiller replaces a dry ice mixture used in the trap of our high vacuum pump to capture stray vapors and prevent their contamination of the particle acceleration tube. By using the chiller we save the daily labor of refilling the main-trap with ice."

Aids Metal Processing Plastics Production

In vacuum-metalizing mechanically refrigerated cold traps have reduced pumping time in humid weather, eliminating production slow-downs. They also help produce a better metalized finish by averting dark spots in the coating caused by molecules of moisture.

Jack Selsemeyer, Production Manager of Kent Plastics Corporation, Evansville. Ind., reports, "On hot, humid days it formerly took us 30 minutes to do a 10 minute metalizing job. Even worse, our reject rates would go up because remaining water molecules caused dark blemishes in the coating. With installation of mechanically refrigerated cold traps over our diffusion pumps, our cycle time is only a few minutes longer and reject rates are back to normal."

Assist In Steel Production

In gas analyzers for steel production, cold traps are proving indispensable in creating a fine vacuum needed to fulfill a two-fold function: (1) to measure small quantities of hydrogen, oxygen, and nitrogen accurately; and (2) to do so rapidly enough so that the results may be used to control production.

For even more rigid requirements than these, firms like Harris Refrigerator Co., Cambridge, have also developed mechanical refrigeration units that will maintain temperatures as low as minus 200F.

Research Explosion Is Attributed to Nitrogen

▶ DR. JAMES PETER HUNSAKER, scientist, was killed August 15 at Burlington, Mass. when a liquid nitrogen vessel exploded. The Milton, Mass. researcher, 44, is reported as being frozen by the liquid nitrogen used in a secret research project. (Estimated temperature was minus 350 F, according to reporters. This leads IR's Editors to believe that other low-temperature elements were involved rather than Nitrogen).

According to UNITED PRESS INTERNATIONAL, foreman Leo A. Carr, 46, was critically injured while another man, David J. Hogbon, 32, suffered minor injuries. Hunsaker was employed by Arthur D. Little Co., Cambridge, a research firm, and was conducting tests on a top secret rocket fuel tank when the blast occurred at the Tech-Weld Corp.

Accident Prevents Another

▶▶ ACCIDENTS as a rule seldom bring anyone any good, but in July '59 of THE LOCOMOTIVE,[1] the editor reports that the occurrence of one accident prevented another. Under the heading "Accidents Foreseen By Inspectors", this publication reported on an operator who had noted that a compressor was running hot and that the oil was foaming. He shut down the unit, an eight-inch diameter twin cylinder ammonia machine, but as he was doing so the piston seized.

According to investigator's report "the intake and exhaust valves were found to be badly worn. Apparently the valves had leaked, allowing compressed ammonia gas to leak back into the cylinders to be recompressed and overheated. The resulting very high temperatures burned the oil from the cylinder walls, and friction from the resulting lack of lubrication froze the pistons to the cylinders."

It Was An Ill Wind . . .

If this accident had not happened, another would have, continued the Hartford editor. "While the compressor was being repaired an inspector used dye penetrant to test the crankshaft for possible defects. He discovered a deep crack located at the crank web closest to the driving motor. After the shaft was broken apart for examination, the crack was found to have progressed through most of the thickness of the web. The breakdown that didn't happen might have destroyed the machine."

THE LOCOMOTIVE, like INDUSTRIAL REFRIGERATION has often pointed out, emphasized that "The background of this incident clearly points up a prevalent cause of unnecessary failures—lack of maintenance and regular inspections. Because of production demands, the plant had been placed on 12-hour shifts."

Accumulator Explodes, Two Engineers Dead

▶ ENGINEERS Jack Day and Henry Huskey for the Maurer-Neuer Packing Co. Arkansas City, Kansas, were killed Sunday August 23, while pumping out an accumulator. An unexplained explosion took place. Ammonia fumes from the blast injured a third employee and three policemen who attempted rescue operations, according to the ASSOCIATED PRESS.

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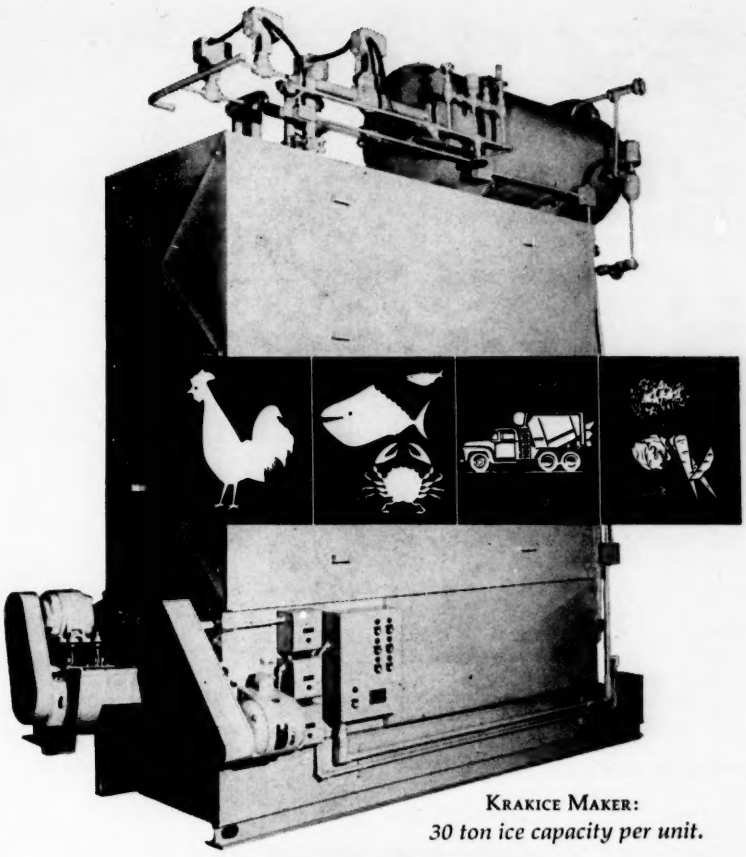
[1]A publication for owners and operators of boilers and power machinery, by The Hartford Steam Boiler Inspection and Insurance Co.



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Fish Freezing:

Methods and Equipment In Commercial Use

By JOSEPH W. SLAVIN[1]

▶▶▶ OVER 350 MILLION POUNDS of frozen fishery products are produced in the USA[2, 3]. The kinds of product produced vary with geographical location. They consist primarily of groundfish fillets, scallops, breaded precooked fish sticks, and bait and animal food in the northeastern states; of round and/or dressed halibut and salmon, halibut and salmon steaks, groundfish fillets and bait and animal food in the northwestern states; of halibut and salmon in Alaska; of shrimp, oysters, crabs and other shellfish and crustacea in the Gulf of Mexico and South Atlantic states; and of round and dressed fish in the states bordering on the Great Lakes.

Fishery products obtained from these areas differ considerably in both physical and chemical composition. Some fish such as haddock or cod, for example, are readily adaptable to freezing and have comparatively long storage life; other species such as salmon tend to become rancid during frozen storage and therefore have a relatively short storage life.

Differences in the composition of the various species of fish harvested in the United States, and the differences in marketing requirements have necessitated consideration of the specific individual product in the selection of packaging materials and in the design and application of equipment for freezing and cold storage. This paper[4] is a review of American packaging, freezing, and cold storage techniques used for preserving fish. Emphasis is placed on prevailing problems.

[1]Mechanical Engineer, Fishery Technological Laboratory, Division of Industrial Research and Services, U. S. Bureau of Commercial Fisheries, East Boston 28, Massachusetts.

[2]Fishery Statistics of the United States and Alaska, Fish Stick Report (C.F.S. No. 1789), U.S. Department of Interior, Fish and Wildlife Service, Washington, D C.; January–March, 1958.

[3]Fishery Statistics of the United States and Alaska, Frozen Fish–1957–Annual Summary (C.F.S. No. 1763), U. S. Department of Interior, Fish and Wildlife Service, Washington, D. C.; 1958.

Packaging Methods

Packaging technology plays an important role in fish freezing and therefore deserves mention. Frozen fish fillets for the consumer trade customarily are packaged in a waxed chipboard carton and overwrapped with materials such as bleached sulfite paper waxed with paraffin or a mixture of paraffin and polyethylene. Cellophane is being used as an overwrapping material for some products, but it tears quite easily.

Overwrapping materials comprised of polyethylene and aluminum foil laminates and cellophane and polyethylene laminates, also have been developed and are in commercial use. Satisfactory methods of heat sealing polyethylene films for overwrapping have been devised, and equipment is being modified for this purpose[5, 6]. These developments will permit use of low cost polyethylene for overwrapping fishery products.

Antioxodants have been incorporated into packaging material in an attempt to retard oxidation, rancidity[7].

Cartons that can be cold-sealed satisfactorily have been developed, eliminating the need for overwrapping and thereby reducing packaging costs[8, 9]. The keeping quality of fish packaged in these cartons, however, has not been reported.

[4]Originally entitled "Freezing Fish In The United States of America", Joseph Slavin presented this work at a meeting of the International Institute of Refrigeration, Commission 4 in Moscow, on September 3 to 6, 1958. It is reprinted here by permission of IIR and the Bureau of Commercial Fisheries.

[5]High-Speed Overwrapping With Polyethylene Makes Debut, FOOD ENGINEERING, *30*, (6), 68-69; June, 1958.

[6]Doyle, Robert, and R. J. Martinovich; A Polyethylene Overwrap Film, MODERN PACKAGING, *31*, (9), 215-220, 302, 304 and 306; May, 1958.

[7]Stansby, Maurice E., S. R. Pottinger, and David T. Miyauchi; Refrigeration of Fish–Part 3, Factors to be Considered in the Freezing and Cold Storage of Fishery Products; Fishery Leaflet 429, U. S. Department of Interior, Fish and Wildlife Service, January, 1956; 65 pages.

Plastics For Wrappers

Materials such as (1) polyethylene combined with cellophane, polyvinylidene chlorine, or polyester and (2) combinations of other plastic materials have been used with high speed automatic packaging machines to vacuum and gas package shrimp, dressed fish, fish fillets, fish portions and fish steaks prior to freezing. In some instances tearing of the wrapping material due to fins protruding from the fish has been a problem. Otherwise this method of packaging has been satisfactory and has afforded the product considerable protection against dehydration and rancidity at a comparatively low cost.

This packaging method has also created new markets for merchandising frozen fishery products. Boil-in-the-bag type pouches made by polyester-polyethylene and combinations of foil, polyethylene and paper have been developed and are being used for packaging shrimp and fish fillets.

Built-up Pack Method

A new method has been developed for freezing and packaging fish blocks[10]. This method consists of packaging fish fillets in the bottom half of the conventional waxed chipboard carton, covering the exposed surface of the fish with a sheet of cellophane, freezing in a plate-freezer, and packaging the frozen blocks four each to a 1½-mil-thick polyethylene bag. This method of packaging results in reduced cost of packaging materials and increased storage life of product.

In 5 and 10-lb. packages of fish fillets for the retail trade, individual 1 to 1½-lb. lots of fillets are wrapped in cellophane or waxed parchment;

[8]Anon; Tear-Strip Carton for Frozen Food, MODERN PACKAGING, *31*, 7, 168-169; March, 1958.

[9]Anon; Tear-Strip Fish Stick Package Test Marketed by Gortons, QUICK FROZEN FOODS, *20*, (9), 130; April, 1958.

[10]Peters, John A.; New Methods of Packaging Fish Fillet Blocks, COMMERCIAL FISHERIES REVIEW, *20*, (4), 22; April, 1958.

the package usually is not overwrapped. The effect of overwrapping these cartons on the keeping quality of the product should be investigated so that the value of such overwrapping material can be determined relative to the increased packaging costs.

Dehydration Retarding, Preservation Supplements

Round fish, dressed fish, steaks, and shrimp customarily are glazed with water after freezing. A 40-percent glucose solution, used as a coating prior to packaging and freezing, has proven successful in retarding rancidity in salmon steaks[11]. This solution now is being used commercially, but no reports on consumer reaction or handling problems are available. Protan, an alginate jelly used in freezing mackerel and herring, has been reported as being successful in extending the shelf life of the product[12]. However, it has not yet found extensive use in U. S. fish freezing.

Freezing Techniques

Refrigeration machines used for freezing fishery products in this country vary in design from rather simple batch-freezing units, which require considerable labor in product handling, to automatic loading and unloading units that utilize mechanical or electronic controls to regulate operation in accordance with the requirements of the product. These machines usually are classified according to their general physical characteristics as being of the shelf-coil, blast, contact plate, or immersion type.

Shelf-Coil Freezers

Shelf-coil freezers generally are maintained at temperatures of minus 20 to minus 30F (−28.9 to −34.4C). Ammonia or brine is used to provide the necessary refrigeration effect. Use of Refrigerant 22 should be considered to prevent costly work stoppage, possible injury to personnel, and damage to product due to leakage. Shelf-coil evaporators generally are made of steel pipe, galvanized on the outside surface. Use of refrigerated plates should be considered because of their greater surface for transfer of heat and lower cost of installation.

Use of the shelf-coil freezer is limited to round or dressed fish such as halibut or salmon; panned fish such as whiting, mackerel, or herring; or institutional 5 and 10-lb. packages of fillets or steaks. Consumer-size packages of fish fillets undergo bulging due to the absence of a method of controlling expansion during freezing. Methods of modifying present shelf freezers in order to freeze consumer-size packages satisfactorily should be considered so that existing freezers of this type can be utilized better.

Rate of freezing in commercial installations is quite slow. At evaporator temperatures of minus 5 to minus 20F (−20.6 to −28.9C), 14 and 16.5 hours are required to cool 2-inch and 2½-inch-thick packaged fish fillets, respectively, from 50 to 0F (10 to −17.8C). Faster freezing can be accomplished by using lower evaporator temperatures or by circulating cold air over products.

Shelf-Coil Disadvantages

Excessive handling of the product is another disadvantage in the use of shelf freezers. As much as three hours are required for loading and three hours for unloading 40,000 lbs. of fish fillets. Infiltration of air and accumulation of frost on the shelf coils during loading and unloading, are problems.

Handling requirements and air infiltration have been reduced by utilizing conveyors to carry the product from the processing room into the freezer, and from the freezer to the cold-storage room. Some labor still is required, however, to transport the product from the conveyor to the freezer shelves and from the shelves to the conveyor. Possibly a mechanical feed system should be considered to reduce handling requirements further.

Space requirements vary with the installation and with the type of product being handled. Space requiremnts of 6 to 7 cu. ft./lb. of frozen product produced per hour[13] have been calculated from information obtained on freezers in the New England area. These space requirements are high and possibly could be reduced slightly through better shelf arrangement.

Blast Freezers

Blast freezers vary considerably in design and consist of a large room, tunnel, or conveyor arrangement within an insulated enclosure. Centrifugal or propeller-type fans provide the necessary circulation of air.

Air velocities of 500 to 1500 fpm are used, with velocities of 1,000 fpm giving the best results in relation to cost of freezing and quantity of product frozen.

Compact and efficient finned-coil evaporators are being used in lieu of bare-pipe-coil evaporators. The evaporator coils are automatically defrosted by being sprayed continuously with an anti-freeze solution.

Flooded ammonia systems with liquid recirculation are used in many installations. Halocarbon refrigerants are used in pilot-plant installations but are not generally used.

Variable-speed fans capacity-controlled refrigeration compressors have been combined with variable-speed conveyors to give accurate control of the freezing cycle to suit requirements of the product. One installation utilizing these features has been built for freezing fish sticks[14] (Fig. 1). A similar unit is being designed for handling fillets, round and dressed fish.

A three-stage blast-freezing system used for freezing unpackaged peas should be considered for fisheries application. In this installation, the product is cooled at air temperatures of 0F. (−17.8C) in the first stage, minus 10F. (−23.3C) in the second stage, and minus 20F. (−28.9C) in the third stage to promote rapid freezing[15].

Forced Air Freezing Methods

Blast freezers are used for freezing such fishery products as shrimp, fish fillets, steaks, scallops, or breaded pre-cooked products packed in institutional size packages; round, dressed, or panned fish; and shrimp, clams, or oysters packed in metal cans. More recently, they have been used for freezing fish fillets wrapped in moisture-vapor-proof heat-sealable packaging films and for freezing unpackaged shrimp and pre-cooked fish sticks. Unpackaged fish sticks frozen in a conveyor-type freezer are automatically packaged after freezing, to further reduce handling cost.

Dehydration of product or "freezer burn" may occur in freezing unpackaged whole or dressed fish in blast freezers unless the velocity of air is kept to about 500 fpm, and the period of exposure to the air is controlled. Consumer-size packages of fish fillets or fish-fillet blocks requiring close dimensional tolerances undergo bulging and distortion during freezing. In blast rooms or tunnels, where the product is frozen on trucks, the use of specially designed freezer trucks

(Continued on Page 22)

[11]Anon; Frozen Fishery Products Storage Life Extended by Glucose-Salt Glaze, COMMERCIAL FISHERIES REVIEW, *19*, (7), 5; July, 1957.

[12]Olsen, Alf; Freezing Fish in Alginate Jelly, FOOD MANUFACTURE, *30*, (7), 267-270 and 285; July, 1955.

[13]Based on shelf freezers of 32,000 and 10,000 cu. ft with freezing capacity of 5,000 and 1,600 lbs of 2½-in-thick packaged fillets per hour, respectively.

[14]Holt, Lawrence; Automatic Quick Freezing—Reduces Costs and Improves Quality, FISHING GAZETTE, *74*, (1), 34 and 55; January, 1957.

[15]Kelsey, Robert J.; What Freezer Do You Need? FOOD ENGINEERING, 29, (1), 102-132; January, 1957.

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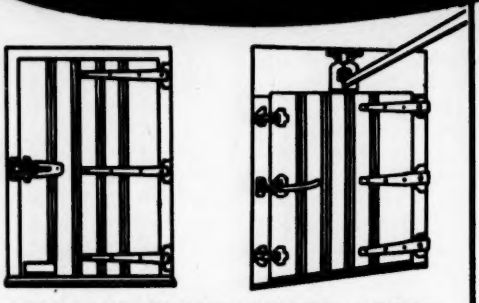
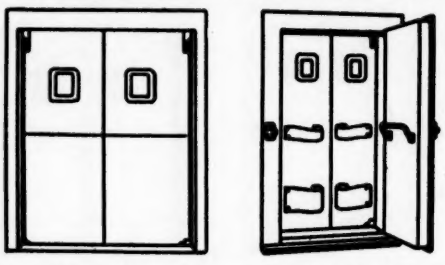
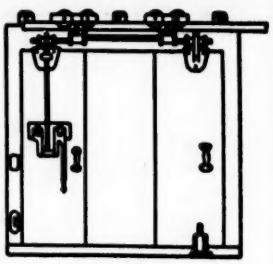


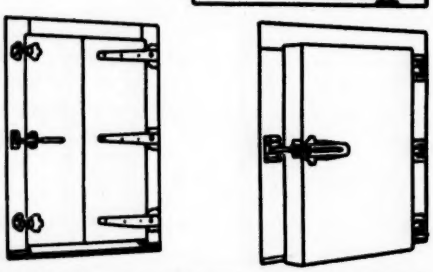
STANDARD COOLER-FREEZER DOORS



STANDARD VESTIBULE AND AUTO-CLOSE DOORS

HORIZONTAL SLIDING DOORS (Manual)





LOW TEMPERATURE INFITTING and OVERLAP

AUTOMATIC ELECTRIC DEFROSTERS WITH THERMOSTAT CONTROL

CATALOGS AVAILABLE UPON REQUEST

FLEXIBLE RUBBER BATTEN DOORS INCLUDING STANDARD DOOR FRAME at no extra cost!

TYPE "TSH" WITH SEMI-HEIGHT MOUNTINGS

Especially adaptable for smaller door openings.

THEY PERMIT

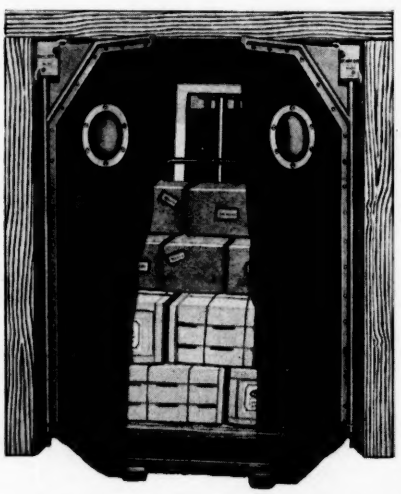
1. Safe passage of hand or power operated equipment with wider pallet loads.
2. Corner cutting with hand and power trucks.
3. Repeated abuse from impact of trucks at minimum damage and maintenance costs.

Model TSH battens are made of ¼" thick Neoprene (no grain) or of ¼" tough specially compounded rubber, reinforced with 2 layers of heavy cotton duck. Materials remain flexible even at extremely low temperatures.

Model TSH battens are furnished with No. 12 gauge galvanized steel jamb guards applied 4' 0" high with *no protrusions into the clear door opening.*

TYPE "FH" WITH FULL HEIGHT MOUNTINGS

Designed for wider and "straight traffic" doorways.



ADVANTAGES

1. Loss of refrigeration is held to a minimum.
2. Extra rigidity — tighter doorways.
3. Eliminates exposure and drafts near loading docks or at other openings.
4. Flexibility of battens permits repeated abuse and shock of mobile equipment contacts.
5. Permits movement of trucks and pallets at high speed in and out of refrigerated or other storage areas.

Model FH battens are made of ¼" thick Neoprene (no grain) or of ¼" tough specially compounded rubber, reinforced with 2 layers of heavy cotton duck. Materials remain flexible even at extremely low temperatures, and will not tear under most severe conditions.

BUTCHER BOY REFRIGERATOR

1000 BUTCHER BOY DRIVE

REFRIGERATOR DOORS

Electro SAFETY-SLIDE HORIZONTAL DOORS

FEATURING **STRUCTURAL SIMPLICITY**

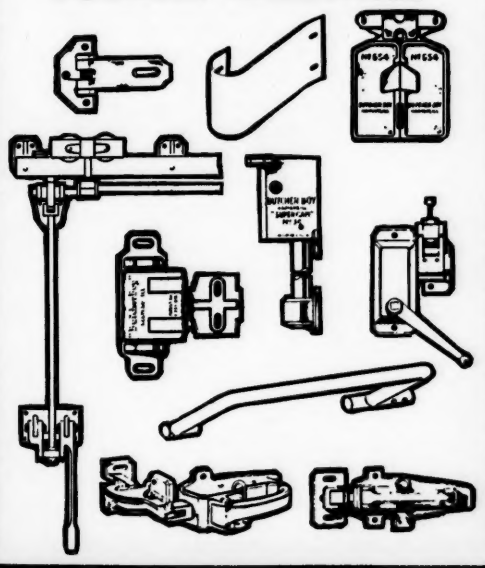
- **MECHANICALLY SOUND**
- **COMBINED "SPEED AND SAFETY"**
- **EXCLUSIVE AUTOMATIC SEALING "Gasket Assembly"**
- **SIMPLIFIED INSTALLATION**

Bi-Parting Horizontal Sliding Doors Available. CAUTION: Not recommended for use in cooler or freezer areas. Bi-Parting double horizontal sliding doors, of necessity, require gasket seals where the doors meet at the center of the opening. Hence, gaskets must be applied at "vulnerable" areas, exposed to contact by trucks or other objects which will rip or tear the gaskets, thereby destroying the necessary seal between the doors. *Field experience dictates this precaution against the use of bi-parting sliding doors.*

14 OUTSTANDING FEATURES

1 Overhead chain drive.
2 COMPACT — Electric Power Operator Assembly.
3 Heavy malleable iron Hanger Brackets.
4 Hyatt roller bearing Door Bracket.
5 Manual "Safety Release".
6 Automatic Sealing Assembly.
7 Automatic Electric Defrosters.
8 Concealed electric systems.
9 Safety Edge.
10 Complete Frame metal clad.
11 Special "SEAL" and "SILL" gaskets.
12 Defroster Drain Outlet.
13 Manual "Interior Safety Release".
14 "Roller-Type" Floor Wedges.

DURABLE HARDWARE



DOOR CO., Dept. "B"
[illegible]

Fig. 1—Conveyor apparatus for freezing fish sticks in a modern blast freezer.—*Courtesy of Gorton's, Gloucester*

Fig. 2—Small plate freezer used for freezing packaged fish fillets is more typical of the pilot plant installation.

enabling distribution of pressure on the surfaces of the package will remedy this condition. No easy solution for controlling the expansion of the product is offered for conveyor installations.

Space and equipment requirements for blast freezers vary considerably with each installation. Information based on tunnel-type freezers in the New England area indicates that a space ratio of 3 to 4 cu. ft./lb. of frozen product produced per hour[16] is realistic. Space requirements for an automatic-conveyor-type blast freezer used in freezing fish sticks are calculated as being between 3 and 4 cu. ft./lb. of frozen product produced per hour[17]. Construction of blast freezers of the automatic-conveyor type for fisheries is increasing in the United States because this freezer offers versatility in operation and handling ease.

Contact-Plate Freezers

Contact-plate freezers are employed exclusively for freezing packaged products and are of manual, semi-automatic, or automatic types (Fig. 2). Flooded ammonia systems generally are used where compressors of over 7½-hp are required; direct-expansion, Refrigerant 12 systems have been produced up to 7½-hp.

Flexible hoses are used to connect the plates to the refrigerant discharge and suction manifolds. Rupture of these hoses due to negative pressure and formation of frost has been a problem with direct-expansion, Refrigerant 12 systems. Higher suction pressures can be obtained by using Refrigerant 22; however, this refrigerant is not used extensively in commercial installations.

Manually operated freezers require considerable labor in loading and unloading. Special trucks have been designed to reduce this handling problem. Products placed on the shelves of these trucks after packaging are easily transferred to the freezer plates with a minimum handling. Handling requirements are reduced further by employing semi-automatic or completely automatic machines. One operator is required for the semi-automatic freezer. In the automatic machine, electronic and mechanical controls are used to feed the packages between adjacent plates and to remove the packages from the unit when the proper freezing time has elapsed (See Fig. 3 for one example).

Plate Applications

Plate freezers are used in freezing fillets, steaks, shrimp, fish sticks fish blocks, scallops, and other seafoods packed in institutional or consumer-size packages. To insure rapid freezing, air spaces in the package must be kept at a minimum. Wooden or metal spacers are used to prevent crushing of the package due to compression between the plates. For most packages, the thickness of the spacers should be 1/32 to 1/16-in. less than that of the package.

Where very close dimensional tolerances are required, as in freezing fish-fillet blocks, a specially designed metal tray is used to hold several packages during freezing and thereby control the expansion of the product. Use of such a tray is not necessary for other packaged seafoods where close dimensional tolerance is un-essential.

Use of automatic contact-plate freezers has been limited to packages of seafood that are over-wrapped or suitably sealed against leakage of water from the package. Water from institutional-size packages of fish fillets or fish blocks that are not over-wrapped may freeze the package to the plates, making it difficult to eject the product from an automatic freezer.

"Wet" Freezers Advocated

Modification of automatic freezers for "wet" packages should be considered. Also, the possibility of preventing dimensional variations in fish blocks in automatic freezers without the use of pans should be studied.

Production, Operational Plate Freeze Factors

Space requirements for the plate freezer are lower than are those of shelf, blast, or immersion freezers. Information on a typical manually operated freezer indicates that space requirements in freezing institutional-size packages are about 0.6 cu. ft./lb./hr.[18]. Space requirements in handling consumer-size packages are less because of the fast freezing rate.

Tests on the performance of a Refrigerant 12, manually operated plate freezer show that in freezing packaged fillets, the ratio of kilowatt hours of electrical energy required for freezing to pounds of product frozen, increases with the thickness of the product[19].

[16]Based on typical tunnel freezer of 4,100 cu ft. having freezing capacity of 1,250 lbs. of 2½-in-thick packaged fillets per hour.

[17]Based on a continuous conveyor freezer of 8,320 cu. ft. having a capacity of 2,500 lbs. of fish sticks per hour.

[18]Based on 18-station freezers of 600 cu. ft., having a freezing capacity of 1,020 lbs of 2½-in-thick packaged fillets per hour.

These data also show that 10-oz. packages of pre-cooked fish sticks require twice as much electrical energy in freezing as do one-lb packages of fillets. The packages of fish sticks also require more electrical energy to freeze than do 5-lb., 2½-in. thick packages of fish fillets.

Immersion Freezers

Advances in refrigeration engineering and fishery technology in recent years have resulted in extensive modification of earlier immersion freezing systems[20] and the development of immersion systems for freezing whole fish or shellfish aboard the vessel[21], [22], [23], [24]. Methods for freezing fish at sea are not within the scope of this paper. It therefore will suffice to say that vessel immersion freezing systems for tuna, shrimp, and groundfish have proven satisfactory and, except for groundfish, are in commercial use.

Successful application of immersion freezers to freezing fish at sea has revived interest in the use of this process for freezing fish ashore. Low space requirements, rapid product-freezing rates, and efficiency of machinery operation are primary considerations in this regard. Use of a glucose-salt solution in lieu of sodium chloride brine has reduced excessive penetration of salt into the product being frozen. Propylene glycol and glycerine solutions also are satisfactory, but high costs prohibit their use.

Fisheries applications of immersion freezers for use ashore has been limited to the freezing of whole, unpacked shrimp. Two such systems are known to be in commercial use in the United States. One is essentially a batch-type unit employing specially designed metal baskets for holding the shrimp. A glucose-salt solution is used as the freezing medium and is maintained at 0F (−17.8C). Product-freezing of 6 to 8 minutes is reported[25].

Shoreside Applications

An automatic-type immersion freezer using a conveyor to move unpackaged shrimp through a tank containing a glucose-salt solution also is used. Uniform and rapid freezing is accomplished by enabling the cold freezing medium to flow, through ducts, over the product on the conveyor belt. Shrimp freezing capacity is 2,000 lbs./hr. A direct-expansion ammonia heat exchanger is used to refrigerate the freezing solution.

Problems experienced with immersion freezers ashore have been concerned with adherence of glucose-salt solution to the product, which increases its total weight; formation of frost on evaporator coils due to absence of back-pressure valves or other suitable means of controlling refrigerant temperatures; and variation in concentration of solution during operation. Considerable agitation of the solution is required because of its high viscosity at low temperatures.

Consideration should be given to the use of immersion freezers for freezing fillets or other seafoods packaged in heat-sealable flexible films or pouches. Its use for freezing whole fish for animal food also should be considered.

Refrigerated Storage

Temperatures of 0F. (−17.8C) or lower generally are used in the newer warehouses and in many of the older ones for the storage of frozen fish. The trend in recent years has been to construct refrigerated warehouses that will maintain temperatures of minus 10F. (−23.3C). In some warehouses, temperatures as low as minus 20F (−28.9C) are being used for storage of frozen fish.

Many of the older refrigerated warehouses that are used for storing frozen fish are of multi-story construction. Bare-pipe-coil evaporators, generally, and brine or flooded ammonia systems are used to provide the refrigeration effect. These warehouses were designed for non-palletized operation,

[19]Slavin, Joseph W.; Technical Note No. 32—Freezing Rates and Energy Requirements for Freezing Packaged Fish Fillets and Fish Sticks in a Multiplate-Compression Freezer, COMMERCIAL FISHERIES REVIEW, *71*, (7), 21-26; uJly 1955.

[20]Lemon, James M.; Developments in Refrigeration of Fish in The United States, Investigational Report No. 16, U. S. Department of Commerce, Bureau of Fisheries, Washington, D. C., 1932; 32 pages.

[21]Butler, Charles, Joseph W. Slavin, Max Patashnik, and F. Bruce Sanford; Refrigeration of Fish—Part 1, Cold Storage Design and Refrigeration Equipment; Fishery Leaflet No. 427, U. S. Department of Interior, Fish and Wildlife Service, Washington, D. C., June, 1956; 146 pages.

[22]Hendrickson, H. M.; Fishing Boats, ASRE DATA BOOK, APPLICATIONS VOLUME, Chapter 32; 1954-55.

[23]Mingledorff, W. L. Jr.: Immersion Freezing, SOUTHERN FISHERMAN, *14*, (12), 38; December, 1954.

[24]Slavin, Joseph W.; Brine Cooling of Fish Aboard a Fishing Vessel, INDUSTRIAL REFRIGERATION, *131*, (4) 30, 32 and 34; October, 1956.

[25]Anon; United Installs Immersion Freezing Plant, SOUTHERN FISHERMAN, *15* (4) 97, 98 and 102; April 1955.

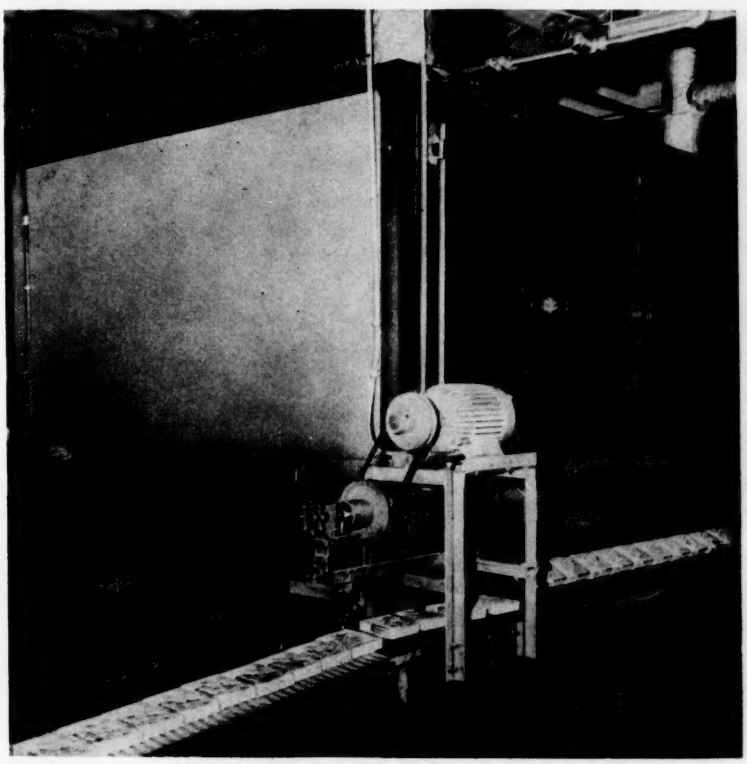


Fig. 3—Packaged fish sticks leaving an automatic plate freezer.
—Photo Courtesy of O'Donnel-Usen Fisheries

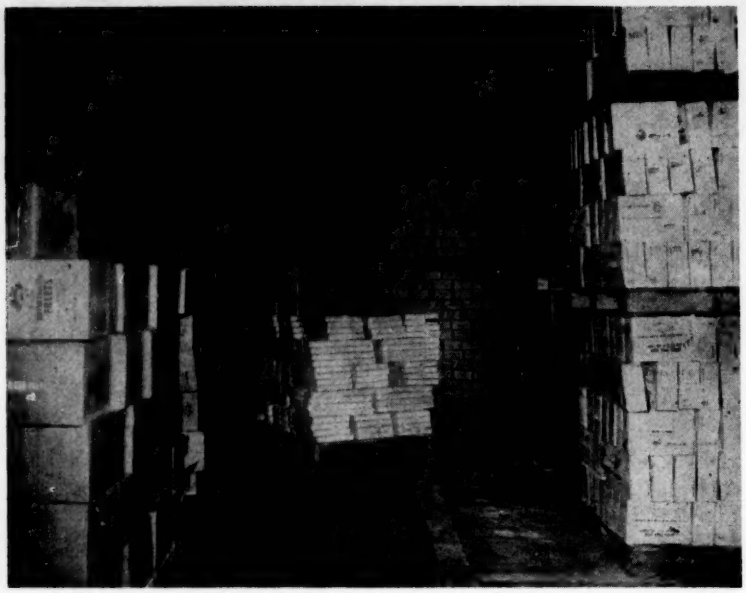


Fig. 4 — Mechanical palletized handling of packaged fish in a modern public freezer storage warehouse on the No. Atlantic sea coast.

—Photo Courtesy of Quincy Market Cold Storage & Warehouse Co.

but conversion to palletized operation has been accomplished by using lightweight mechanical lift trucks. This conversion has reduced the labor necessary for product handling by 50 percent.

In the last decade, many new refrigerated warehouses have been constructed for storing fish and other foods. These warehouses are one or two stories high and are palletized throughout (Fig. 4). Location and design of the loading facilities in these plants permit mechanical unloading of frozen fish from refrigerated railway cars or trucks directly into the cold-storage rooms. A modern warehouse located on the eastern seaboard is situated so that frozen fish can be unloaded from refrigerated vessels into the frozen-storage area. Air-operated freezer doors and hydraulic ramps for unloading trucks facilitate handling of products.

Finned, Bare Pipe Coils

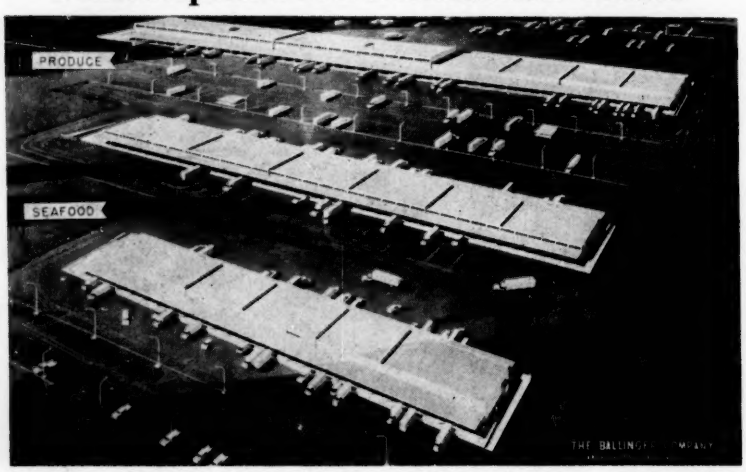
Even in these newer storages, bare pipe or finned pipe-coil evaporators are used in conjunction with flooded ammonia systems. Refrigerant 12 also is being used successfully in some of the larger installations. Finned-pipe coils offer the advantage of low evaporator cooling surface over the aisles for easy defrosting. Hot-gas defrosting is provided in many new plants. Automatic controls are used. In several plants, an alarm system connected to the local telegraph office warns of equipment breakdown, fire, or forced entry into the premises.

Jacketed Freezers

Reports of tests conducted by several investigators have shown that a jacketed-type freezer should be given serious consideration for the storage of frozen fish because of the high relative humidity that can be obtained[26, 27, 28, 29]. A plant employing the jacketed principle has been constructed on the western seaboard. Satisfactory operation has been obtained, and as a result of the high relative humidity, dehydration of the frozen fish has been minimized.

Author Slavin has been invited to speak to the National Association of Practical Refrigerating Engineers at their annual meeting, Dec. 11 at New Orleans, on Jacketed Freezers.

Philadelphia Food Distribution Center



Produce and Seafood Markets in the Food Distribution Center, Philadelphia, Pa., officially opened June 22. Part of the larger Philadelphia urban renewing project, the two markets replace old, unsanitary and inefficient markets located in the Dock Street area. Representing an investment of $4½ million dollars, the markets occupy 27 of approximately 63 acres planned for Stage One in the modern distribution center. Stage Two will bring the project to 80 acres. There are 53 wholesale produce merchants leasing space in the produce marketing and 19 seafood wholesalers in the seafood markets. The center provides air conditioned offices but tenants provide own refrigeration.

[26]Anon; Jacketed Freezer Cold Storage Room, COMMERCIAL FISHERIES REVIEW, *18*, (5), 16-17; May, 1956.

[27] Lentz, C. P.; Humidification of Cold Stores—The Jacketed System, CANADIAN JOURNAL OF TECHNOLOGY, *33*, (4), 265-278; July, 1955.

[28]Slavin, Joseph W., John A. Peters, and S. R. Pottinger; Some Effects of Modern Refrigeration Design and Engineering on the Storage of Frozen Fishery Products. A paper presented at 18th annual meeting of the Institute of Food Technologists in Chicago, Illinois, U.S.A.; May, 1958.

[29]Young, O. C.; The Jacketed Principle in Canadian Cold Storage, CANADIAN REFRIGERATION JOURNAL, *18*, (11), 21-22; November, 1952.

Industry Meetings

Ice Production — **Sept. 13-15**
THE FLORIDA ICE ASSOCIATION
Lido Biltmore Club, Sarasota, Fla.

Brewers Exposition — **Sep. 20-25**
MASTER BREWERS ASSOCIATION OF AMERICA
INTERNATIONAL BREWING INDUSTRIES EXPOSITION
Public Auditorium, Cleveland

Instrumentation — **Sep. 21-25**
INSTRUMENT SOCIETY OF AMERICA
International Amphitheatre, Chicago

Meat Packing — **Sep. 25-29**
AMERICAN MEAT INSTITUTE
Palmer House, Chicago

Dairy Conventions — **Oct. 4-10**
DAIRY INDUSTRY SUPPLY ASSN.—Oct. 4-10
Saxony Hotel, Miami Beach
MILK INDUSTRY FOUNDATIONS—Oct. 5-7
Fontainebleau Hotel, Miami Beach
NATIONAL ASSN. OF ICE CREAM MFRS.—Oct. 7-9
Eden Roc Hotel, Miami Beach

Brewing Meet — **Oct. 18-20**
BREWERS ASSOCIATION OF AMERICA
Edgewater Beach Hotel, Chicago

Ice Manufacturing — **Oct. 20-24**
NATIONAL ICE ASSOCIATION
Sheraton-Dallas Hotel

Service Engineers — **Oct. 30-31, Nov. 1-2**
REFRIGERATION SERVICE ENGINEERS SOCIETY
Ambassador Hotel, Atlantic City, N. J.

Air-Cond'g & Refrig'n Exposition — **Nov. 2-5**
11TH EXPOSITION OF THE AIR-CONDITIONING AND REFRIGERATION INDUSTRY
Convention Hall, Atlantic City, N. J.

Ice Engineers — **Nov. 11-12**
SWIMA ANNUAL CONFERENCE OF ENGINEERS
Rice Hotel, Houston

Chemical Processing — **Nov. 30 - Dec. 4**
27TH EXPOSITION OF CHEMICAL INDUSTRIES
New York Coliseum

Safety Congress — **Oct. 19-22**
NATIONAL SAFETY COUNCIL
Various Chicago Hotels

Practical Refrigerating Engineers — **Dec. 9-11**
NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATING ENGINEERS
Roosevelt Hotel, New Orleans

Air Conditioning Exposition — **Feb. 1-4, 1960**
2nd SOUTHWEST MEETING & AIR CONDITIONING EXPOSITION
Memorial Auditorium, Dallas, Texas

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AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS, INC.
Memorial Auditorium, Dallas

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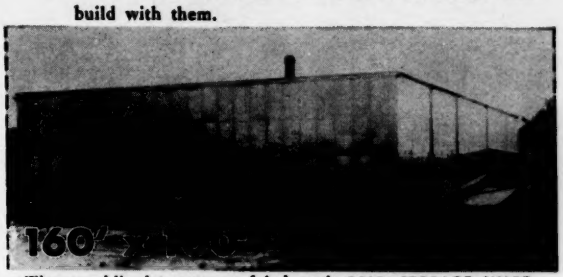

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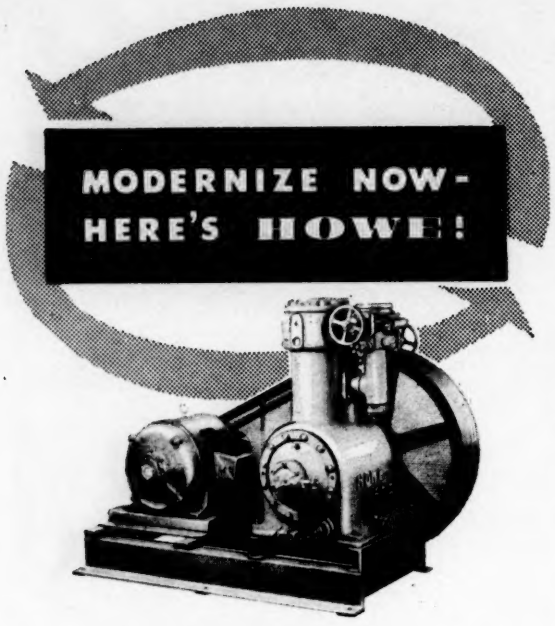

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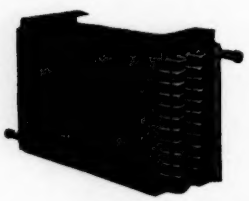
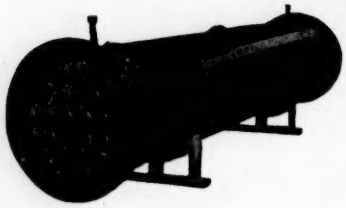
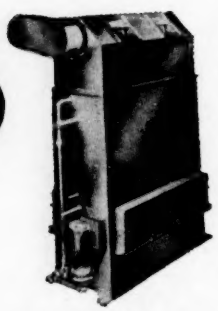


FIN COILS

RAPID FREEZE UNIT COOLER



SHELL AND TUBE CONDENSERS AND COOLER



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BOOK REVIEWS:

Operating Data; Proceedings

OPERATING DATA BOOK, 1959 — $5.00

Nat'l Ass'n Practical Refrigerating Engineers, Inc.

▶▶ FORMAT introduced in 1958 has been continued in the 1959 issue of the NAPRE OPERATING DATA BOOK. Dividing the book four ways, the editorial scheme groups engineering papers under these classifications: Erection Techniques, Operating Procedures, Maintenance Practices and Supervision Methods.

Two papers are presented under Erection Techniques. Application hints for proper erection to make efficient installations of foamed polystyrene board forms, are detailed with seven sketches in the first presentation. Basically the paper by J. P. Sawyer contains "do's and don'ts" of erection practice.

Second paper in the erection category dealt with pre-installation planning for locating evaporative condensers. John Engalitcheff, Jr., shows how piping pays off in apparatus effectiveness. There are seven sketches and four pictures showing foundations, duct connections and piping arrangements.

Compressor Operation

Operating Procedures presents a paper on the "do's and don'ts" of maximum compressor performance. Admonishing operating engineers that satisfactory service and long life of compressors and other refrigeration components are strictly up to them, H. B. Howe details operating steps for starting, stopping, lubricating and otherwise servicing vertical, single-acting machines. A daily check-off list is given.

Refrigerant feed controls were dealt with in one paper under the maintenance heading. Preventive maintenance programs for solenoid valves, float controls, pilots and feed systems are detailed by R. R. Ross. Importance of periodic inspections to save time, work and money, are emphasized. Trouble shooting rules are outlined.

Another maintenance paper dealt with factory service contracts. Service provided by the manufacturer for new equipment, agreements for inspection, adjusting and oiling, and certified maintenance contracts for plant equipment introduced the article by Irving Weinberg. Maintenance hints on multi-cylinder compressors, and for the plant in general are detailed in the balance of the paper.

Supervisory Topics

New insulating materials introduced recently have served somewhat to confuse the practical chief who finds that he has to specify thicknesses for various pipe lines and vessels. A new estimation method which can be helpful to practical engineers is introduced in the first paper under Supervision Methods in the '59 ODB. Insulating Refrigerating Systems is the topic of this paper by Dean Emerson. A nomograph is provided for selecting insulation thicknesses to prevent condensation, and a chart is provided for the selection of insulation by classes and thicknesses to minus 400 F. Practical application instructions are given.

Clarence Wentink in a 3-page feature under Supervision Methods, describes a Pump Setting Technique which saves time and money. As an erection engineer, he suggests to the chief or his plant supervisor that this idea and a little advance planning on their part, results in added convenience for the owner and contractors.

Concluding paper presented in the issue is a story on how engineer supervisor John G. Muller and representative Hal Jarvis teamed up to beat the calendar in an expansion project. The paper deals with the complete erection of a 300,000 cu. ft. minus 30 F storage space within a stipulated time limit.

OPERATING DATA; PROCEEDINGS

HANDLING PERISHABLE AGRICULTURAL COMMODITIES

Thirteenth National Conference Proceedings

▶▶ SPONSORED BY the College of Agriculture and the Agricultural Extension Service, Purdue University, the Association of American Railroads, and the American Railway Development Association, is a national conference annually on transportation of fresh and frozen produce by railroads. Following the conference a proceedings is published. The publication is available to the trade through the co-operating groups which in addition to Purdue University, AAR and ARDA, are: Western Weighing and Inspection Bureau, Railroad Perishable Inspection Agency, Southern Weighing and Inspection Bureau, Transcontinental Freight Bureau, United States Department of Agriculture, and Railway Express Agency.

Proceedings of the Thirteenth National Conference contain some 20 papers presented at the March 10-12 seminars. Among these papers are such topics as: Research Activities in the Handling and Transportation of Fruits and Vegetables; Relation of Load Size to Commodity Temperature in Refrigerator Cars; Effect of Heavier Loading of Rail Shipments on the Marketing of Fresh Fruits, Vegetables; Transit Refrigeration of Fresh Strawberries; Canadian Refrigerator Car Developments.

New Car Developments

General Perishable Freight Agent H. R. Hudgens, Jr., C B & Q RR, discusses new developments in the transportation of perishables in one paper. In effect, the paper is a report on the new type of insulation, unit, and air circulating system applied to car MNX 2389. According to Hudgens the new insulation is expected to eliminate damaged car structures and loss of insulation effectiveness due to moisture accumulations.

The refrigeration compressor described is that designed and built by Sterling Refrigeration Engineering Co. Described as rugged, high capacity, it is an 8-cylinder designed with 4 banks of two cylinders arranged on 30 degree radial spacing. It is driven by a Mercedes-Benz 4-cylinder 4-cycle diesel. Tests have shown fuel consumption to be less than one-half gph, which is less than one-half fuel rates of other systems in use.

Heating and defrost of the coils is accomplished by a modified reverse cycle. Air circulating fans are hydraulically driven. The pump is belt driven by the engine. During period of defrost, the motor is unloaded by electric solenoid to stop the fans; otherwise they operate continuously.

Circulating Fan Cars

Developments in temperature control for non-mechanical cars were presented by D. E. MacLeod, Preco, Incorporated. The Cargo-Temp system was described, showing how a 5-hp diesel, alternator, and three fan panel under thermostatic control, operates to give uniform temperature throughout the water-ice type railroad car

Mechanical Research

New development in mechanical research was decribed by G. H. Newcomer, AAR. Relative to refrigerator car statistics, this paper noted that there had been a 45 percent increase in new mechanical cars placed in service in a 14 month period. He pointed out that 500 of those cars were 50-ft vehicles and the remainder 40-ft cars. A new 50-ft, 70-ton capacity, mechanical car has been designed which is expected will be the all purpose car for handling non perishable loads westbound, as well as fresh or frozen perishable eastbound loadings.

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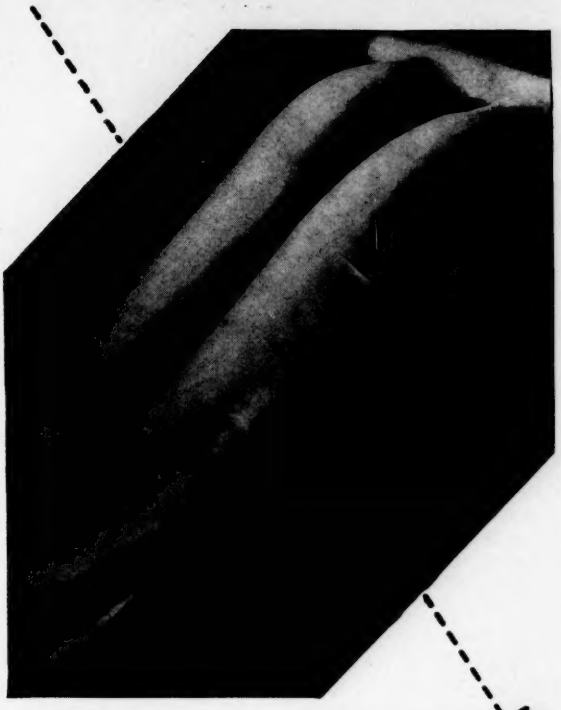

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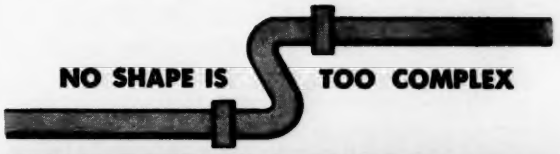

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PUBLIC COLD STORAGE WAREHOUSE

▶▶▶MORE EFFICIENT OPERATION of the refrigeration plant has been achieved at Detroit Refrigerating Div., Beatrice Foods Corp., through a recent remodeling program. This public cold storage facility was operating at very near maximum refrigeration capacity, with horizontal double-acting compressors, hand expansion control, double pipe brine chillers, and non-modulated atmospheric (condenser) water towers.

Considerable thought, study, engineering experience and know-how was required to modernize the plant at a cost consistent with operating economies which could be effected in an estimated number of years at which the savings would be relatively constant; and, without interruption of warehousing operations. Beatrice's Chief Engineer, Gordon Hobbs, Detroit Refrigerating's Chief Engineer, Cameron McLaren, and York Div., Borg-Warner Corp., Branch Manager R. E. Miller, are principally responsible for the changes effected at 2030 Howard Street.

Original System Used Both Brine, Direct Expansion

Installed about 1917, the original plant consisted of about 1,000,000 cu. ft. of freezer volume and about 850,000 cu. ft. of cooler storage volume. The freezer rooms were handled with about 140,000 lin. ft. of 2-in pipe operating on direct expansion ammonia, while the cooler rooms operated with about 66,000 lin. ft. of 1-1/4-in pipe on a brine system.

The original plant was probably designed to operate on a single suction pressure at about three to five pound pressure. At this original design condition the combined capacities of the two existing compressors (one 68 rpm York 15½ x 30-in horizontal double acting duplex, and one 74 rpm York 13½ x 26-in HDAD) was from approximately 145 to 165 TR.

Based on storage volumes it was estimated that the average freezer load requirements were about 100 TR and the cooler load requirements were about 45 to 60 TR. These estimated averages were based on the type of operation presently used by Detroit Refrigerating Div.

Pre-Alteration Work Operating Headaches

Existing brine coolers were of the double pipe type which had been giving considerable trouble in both maintenance and operation. Several other areas of difficulty were experienced in the operation of the plant. Chief McLaren found that it was necessary to give practically constant attention to the setting of the hand expansion valves in the freezer spaces as the head pressure varied both daily and seasonally. It was also extremely difficult to maintain head pressure on the compressors since no capacity modulation devices were incorporated in the atmospheric towers.

Proposed solution to revamping of the plant was to change the freezer operation over to liquid recirculation thus maintaining a constant pressure on the hand expansion valves year around. This would eliminate the largest single problem in the operation of the plant.

Brine Coolers Replaced

In addition, it was determined that the double pipe brine coolers should be replaced by a shell and tube type for simplicity of maintenance and operation. Further, it was determined that the atmospheric tower should be provided with three step operation. First step of capacity on the tower should be the six inch water discharge direct to the sump, the second step diverting the condensing water through 3/4-in pipes to the sump, and the third step of operation being at full capacity through the spray nozzles.

Pressure Actuated Compressor Control

Automatic compressor control was indicated in order to save on both power and labor costs. Further, the compressors were to be arranged for booster operation in a two-stage system, to further conserve power and reduce operating costs.

Normally, on converting such a plant as this to a booster system it is customary to pick the intermediate pressure of the two-stage system by the requirements of the high temperature load. However, in this particular case, the high temperature loads required a rather low brine temperature for satisfactory room conditions, which in turn required a rather low suction pressure for the high stage compressors. (The direct expansion coils are presently holding the freezer rooms at minus 10 F, while the high temperature rooms are supplied with brine at 15F.)

Single Plant Suction

In view of this, plus the interest of a simplified plant hookup, and in order to allow for future conversion of coolers to freezers, it was determined that the coolers and freezers would operate at a single plant suction pressure. The suction pressure at the brine cooler would be controlled by a suction pressure regulating valve.

Baltimore's New Marsh Produce Market

Construction of a new million dollar market center was undertaken with the signing of a contract by members of the New Marsh Wholesale Produce Market Authority, Baltimore, early in June. They are pictured here, left to right: Seated, J. Miller Merritt, Dr. R. Walter Graham, Jr., Samuel M. Hecht; Standing, Dr. Paul E. Nystrom, W. Dale Hess, Robert H. Martin, Joseph L. Manning, John B. Foard, Jr. On Pulaski Highway, the $969,000 facility will house 25 produce houses. The City-State supported authority leases space for which merchants provide their own offices and refrigeration.

REFRIGERATION PLANT REMODELING

It is not always necessary to retire *all* older equipment in a modernizing plan. An atmospheric cooling tower piping arrangement was modified in this plant to give 3-step capacity.

Management's Decisions

After the detailed engineering analysis and planning were presented to Beatrice Foods' management, it was determined to go ahead with the proposed solution to the plant problems. In addition to the changes outlined, a number of other changes were incorporated into the plant remodeling. Size of the refrigerant receivers was increased from two 16-in x 18-ft receivers to two 36-in x 16 ft. Installation of a temperature indicating system to permit reading room temperatures throughout the house from the engine room, was authorized.

Non-Interruption Schedule

The new refrigeration system was installed over a period of about four months during the Winter of 1958-59. All during the remodeling operation the plant was carried on the existing 13½x26-in. compressor. Needless to say, it was the very close cooperation between plant personnel and contractor employees which achieved this changeover with minimum disruption to the company operations.

New Equipment Items

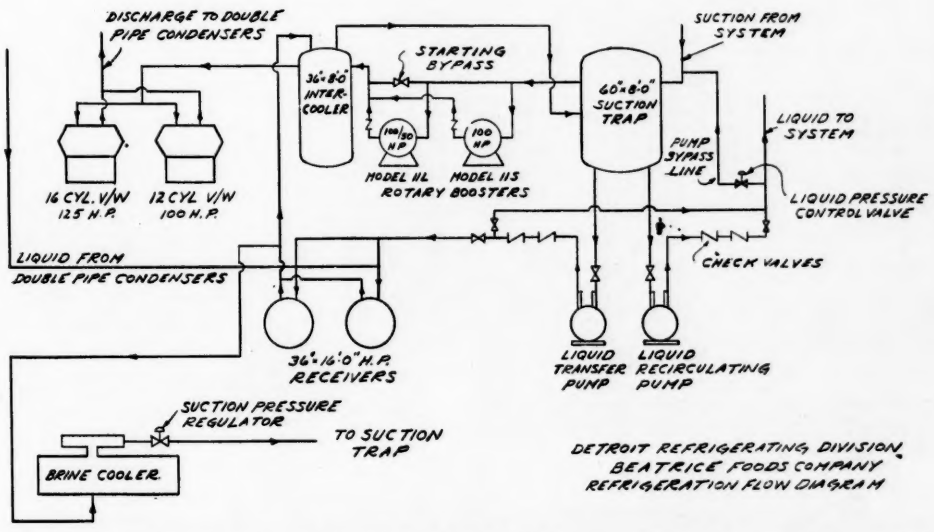
As installed, the new compression plant utilizes two York V/W compressors, one 125-hp 16-cyl and one 100-hp 12-cyl. Low stage machines are York rotary boosters, one 100-hp/50-hp with a two speed motor and one with a 100-hp motor. These low stage compressors take suction on a 60-in x 8-ft suction trap and discharge into the 36-in x 8-ft intercooler. The control system is set up so that plant suction temperature is controlled by varying the rotary booster capacity, while intermediate suction pressure is regulated through a step controller governing the capacity of the high stage reciprocating compressors.

Recirculating System

Two York liquid pumps are installed, each taking suction from the 60-in x 8-ft suction trap. One pump is intended primarily as a liquid transfer pump, but may be used as a stand-by for the liquid recirculating pump. The liquid recirculating pump discharge pressure to the system is controlled through the liquid pressure control valve which causes liquid to flow through the pump bypass line, depending on the requirements of the systems. This pressure is maintained at about 100 psig year around, thus providing positive and constant flow through the hand expansion valves at the various freezer rooms.

Results of the plant remodeling have proven to the satisfaction of all concerned. The operation of the freezers has been smoothed out in comparison with previous behavior. Constant temperatures are being maintained with little or no attention. The refrigeration plant is operating at higher back pressures and has much less oil carry-over than formerly. The brine cooler, of course, now operates completely unattended. Chief McLaren, an active member of the Geo. B. Bright Chapter, NAPRE, Detroit, indicates that the improvements have made possible the assignment of four operating men to other work in the plant.

Engine Room Views Showing New Equipment, Pages 30, 31. ▸



Schematic showing new equipment provided and piping hook-up required between these items which provide virtually automatic operating conditions for several temperature levels.

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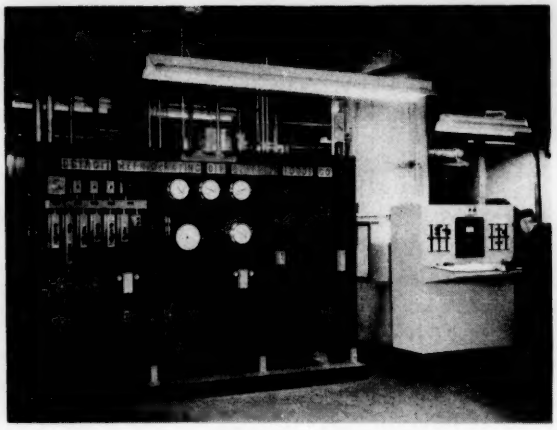
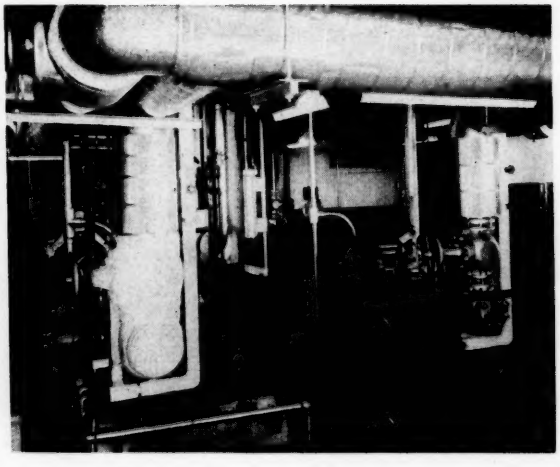


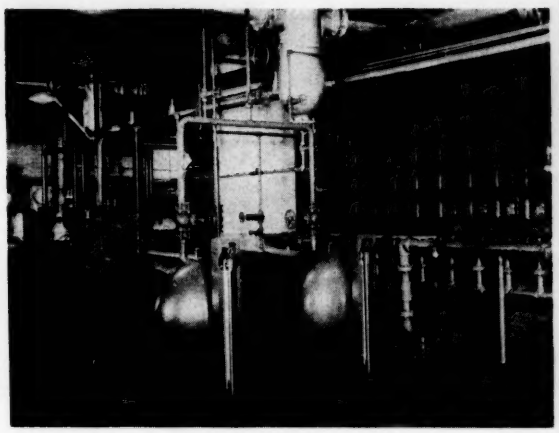
Two 3-ft OD x 16-ft receivers replaced two 16-in x 18-ft vessels as one step in the plant improvement schedule at Detroit Refrigerating Div., Beatrice Foods Co. Some older equipment similar to that at the right was retained and modified where it was in good shape and refinements considered to be economically feasible.



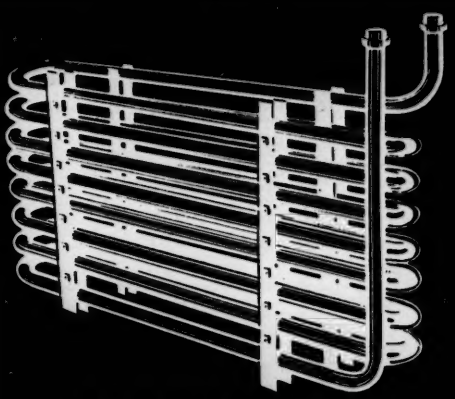
High-stage compression is achieved with two VW compressors; a 12-cyl 100 hp unit and a 16-cyl 125 hp machine behind it. Vertical vessel is 3-ft OD x 8-ft intercooler.

BEATRICE FOODS CORPORATION

Main control panel incorporates all the necessary manual start-stop switches for compressors and pumps; automatic sequence and capacity step controllers for booster and high-stage compressors, and atmospheric cooling towers; customary high—low cut-outs; gauges and three-pen recorder. At right is the log console with temperature indicating system which permits reading storage room temperatures from the engine room.



Two 100 hp rotary boosters, one with ½ capacity 2-speed motor, take suction from a 5-ft OD x 8 ft liquid trap. Liquid pumps supply the house or transfer to receivers.



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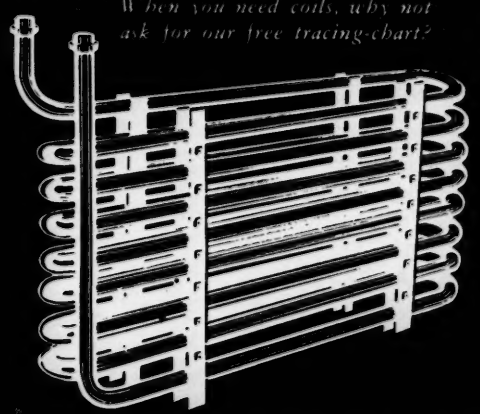

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NAPRE QUESTION BOX

H. P. Hayes

HAVE A QUESTION? Address it to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif. Answers appear monthly in this department on problems forwarded by NAPRE members. Comments from all readers welcomed.

Refrigerated Meat Facility Data Sources

QUESTION: Where can particulars be found on refrigeration practice and construction criteria for meat chilling, especially beef and hogs; also on freezing facilities and practices for these meat products?

—C.E.M., U.S.A., Chgo.

ANSWER: Criteria for special requirements in the storing of both chilled and frozen meat items, is contained in the 1959 ASRE DATA BOOK, REFRIGERATION APPLICATIONS, Chapter I, "Carcass Chilling and Holding Coolers". Preceding the refrigeration specifications, you will find such data as spacing of meat rails, spacing product on the rails, distance off of obstructions, rail height, etc.

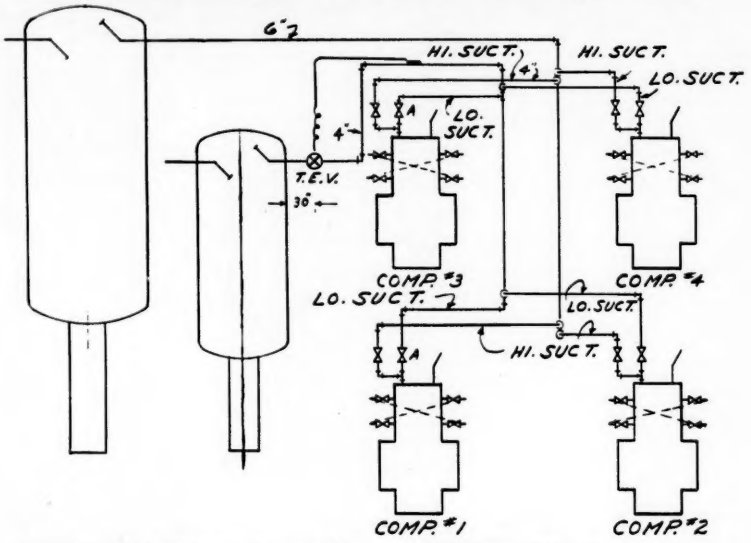
Similar information can be obtained from The Meat Inspection Division, Agricultural Research Section, USDA, Washington 25, D. C. There is no charge for a pamphlet issued by this activity entitled, "Information for Applicants for Federal Meat Inspection and Owners and Operators of Official Establishments". That bulletin is exceptionally good reference or guide for construction purposes whether it be for slaughtering, wholesale or retail activities.

For frozen meat products, see also Chapter 15 of the same ASRE DATA BOOK. You might also pay a visit to the American Meat Institute at 59 East Van Buren, Chicago 5, Ill.

Also, in case you may have overlooked it, the various branches of the Defense Department have standards established for construction of cold storage rooms and freezers which includes facilities for meat products; for example, the U. S. Navy, Bureau of Yards and Docks, and the U. S. Corps of Engineers which has a number of such projects under construction at the present time both for the Army and for the U. S. Air Force.

—W.A.M. & J.R.K.

Superheat, Slop-over Complicate Operating



QUESTION: What is the probable cause of liquid NH_3 accumulating in low suction branches to compressors No. 1 and No. 3 pictured in the accompanying schematic, when suction valves "A" at the machines are closed a short time? Liquid accumulates in the suction riser which is directly above both compressors.

Note that the horizontal run-out from these machine risers to the system low suction is directly into the main; whereas the high suction to compressor No. 1 and No. 3, and both high and low suctions for units No. 3 and No. 4, all take about a 12-in rise out of the suction mains before they branch horizontally.

Operating pressures: low suction, 0 to 5 psig; high, 20 to 30 psig. Suction mains from slop-over tanks are 6-in, and branches, 4-in. Return lines from freezer and storage operations to slop-over tanks are both 4-in, about 500-ft long, insulated with 4-in thick fibrous glass material with aluminum jacketing. Main engine room suctions are pitched to the slop-over vessels.

—M.C.S., Bal Harbour, Fla.

ANSWER NO. 1: My firm was called in at this plant about three years ago to install an expansion valve in the low temperature suction line to lower the superheat. Of course, this was in accordance with their drawings, but I admit that we believe it is part of their trouble.

Most of this trouble is experienced in machine No. 1, which operates now with machine No. 4 on the low temperature suction. The suction line runs horizontally to machine No. 1 and rises from the suction header about 12-in to machine No. 4. The bulb on the expansion valve desuperheating the suction is not insulated; in fact, it is encased in ice.

They have three air handling units in their freezer and defrost them manually with water. At present they cut off one compressor and let the suction pressure rise to about 20 psig. in the units while they turn the water on them. This is when they have their worst slop back.

Their accumulator is ample in size and the liquid return pump works. Float switches ring an alarm bell if it doesn't.

They have solenoid valves in their suction lines from each air handling unit, but they are not now in use.

Our advice was: (1) Stop the desuperheater when only one machine was operating; (2) Cut off both machines and close the solenoids in each air unit when defrosting with water (provided a relief valve set at about 75 psig is placed to relieve the coil back to the main suction).

Upon completion of the defrosting, start the compressors and open the solenoid on the air handling unit suction lines one at a time, giving a leveling out period between each. We believe this will eliminate most of their trouble and give clearer defrost.

Of course, in our plants we always step up a suction line before we go to a machine from a suction header, and we use a booster compressor instead of a desuperheating expansion valve.—**R.S.M., D.E.S. Memphis.**

Further Explanations

Acknowledgment: Prior to installation of the expansion valve, we operated our evaporators with a hand expansion valve partially open in addition to our lowside floats, trying to bring our superheat down to normal. In summer months we still use them to maintain a flooded evaporator and also to aid in our desuperheating problem. (This may be rectified if the bulb for the desuperheating expansion valve was not in ice, as RSM brought out.

We have also found that should we cut off this expansion valve even in winter months, we continue to run with an excessive superheat, with our cylinder walls heating also. It is our belief that this is injurious to the machine insasmuch as with hot cylinder walls, it cuts down on the lubricating efficiency of oils pumped to the cylinders. We have experienced some expensive liner, ring and piston repairs which we feel is partially due to this.

As to the suggestion that we cut off our machines and close the solenoids while defrosting, we did this for several months and found that it seems to increase the amount of liquid getting back to our compressors. Of course, this could have been caused by our failure to cut off the ammonia supply to the desuperheating expansion valve while defrosting, and also in our not allowing enough leveling off time when putting each unit back in operation.

The reason for our not cutting the expansion valve off is because it's supply line is tied into the feeder line to our Armstrong purger and does not have a cut-off valve in the line at an operating level. After teeing off the liquid supply source, there is no stop until just before entering the TXV (which is inaccessible without a ladder, due to the suction line height from the floor).

Since RSM's visit to our plant, we have pinched down on the amount of ammonia being expanded into our suction line, helping considerably.

I would also like to point out that we were having this trouble before the TXV was installed. Perhaps not quite so bad. Nevertheless, liquid would accumulate in the low suction.

That is the reason we are inclined to believe that we are getting a condensing effect. We believe that while defrosting, we get a rise in pressure with little or no increase in temperature. Therefore, condensation of NH_3 occurs in the suction line.—**M.C.S.**

Charges Pipe Short-cuts

ANSWER NO. 2: It is the opinion of this Question Box contributor that the main suction is not pitched adequately to the accumulator. It is probably level from the ell (pictured) to the machines, and pitched only from the ell to the vessel.

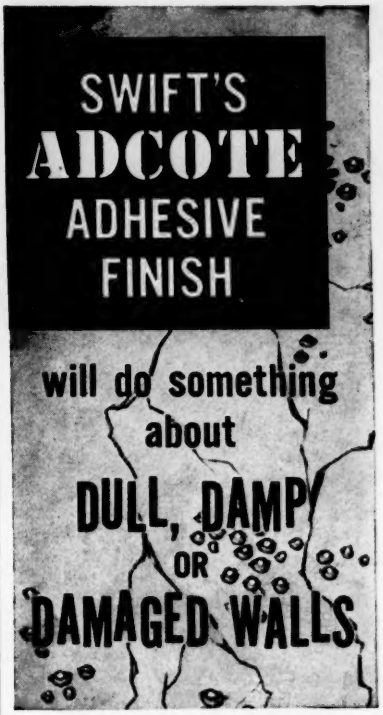
Consequently, like MCS states, during defrost shutdown and the rise in pressure with little temperature gain, some condensing may occur; but, it has been this person's experience that the liquid accumulation for the most part is in the bottom of the main, not the machine branches. Quick start-up will move a wave of liquid to the nearest machine.

Very careful start-up procedures should therefore be observed. Open the suction valve most slowly, permitting less than ounces of liquid which may be trapped in your riser to enter the machine per revolution. If at all possible, use one of the machines (No. 2 or No. 4) which has the 12-in. rise out of suction.

It would appear that a short cut in piping occurred, when 6 or 8 branches rise 12-in off the mains and then to the machines, while two run out direct. Those rises cause liquid to be dammed and boil off before reaching the other machines.

Using liquid injection is another short cut in piping. MCS's sketch shows returns just entering those traps. A desuperheating effect could be achieved by extending those lines well into the liquid carried in the vessel. Make the slopover tank become, in effect, a gas cooler. For a similar superheat, slopover problem and its solution, see the article by Harvey A. Wishart, the Larsen Co., 1955 NAPRE Operating Data Book.

—**R.F., Chicago.**



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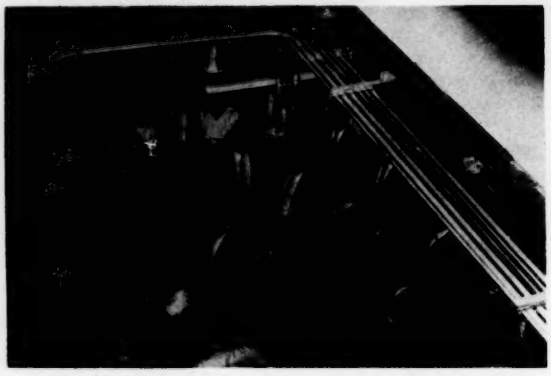
Jacketed Freezer Studies Slated For Review At 49th NAPRE Meeting



Members of Louisiana Chapter No. 2, NAPRE, on a preview inspection of package boilers in the new Tulane University air conditioning plant. William H. Russell, center with microphone, who designed the plant, is explaining operation of steam units which produce 96,000 lbs/hr.

Charles E. Gilbert, chief engineer, Tulane's physical plant, explaining a flow control panel in the University's new air conditioning plant. With other members of NAPRE, are William H. Russell (center, hands folded), designer, and Max W. Sofer, chapter president (at Russell's right).

▶▶JOSEPH W. SLAVIN, Mechanical Engineer, Bureau of Commercial Fisheries, U.S. Department of the Interior, will present a paper on jacketed freezer studies which have been conducted at the Technological Laboratories of the Fisheries and Wild Life Service, when the National Association of Practical Refrigerating Engineers meets at New Orleans, December 9, 10 and 11. This announcement came from Richard E. Zach, Refrigeration Instructor, University of Wisconsin, Program Chairman.

Open 50th Year Celebration

This annual affair will see the start of a 50th anniversary year of celebration on the part of the Association. A group of engineers designating themselves as practical refrigeration engineers, agreed at Texarkana in 1909 to meet the following year in Shreveport, Louisiana, for the purpose of forming a national organization. It was for this reason that Louisiana Chapter No. 2 was chosen to be hosts to open the 50th Year for NAPRE.

Educational Side Lines

Although Zach has planned 10 educational features for the 3-day meeting, there are a number of attractive sidelines being arranged, as has been the custom of NAPRE. For example, the Delgado Trade and Technical School will be open to convention visitors at all times and the new Civic Center central station comfort air conditioning plant will also be available to delegates and visitors. Other field trips to plastic raw material producers, cold storage plants and various manufacturing establishments are being arranged.

In July, Director Marvin Thames, Delgado Trade and Technical School, New Orlean, extended a welcome to NAPRE to attend at any time, the day and night sessions at the school which is the center of an apprenticeship and training program for the Crescent City and surrounding parishes (counties). Delegates and visitors shall have free access to operating engineering and refrigerating classes, as well as other sessions being conducted.

The opportunity to visit the Delgado training classes will probably cause many NAPRE convention attenders to reflect on a similar arrangement at Detroit and Chicago in 1956 and '57, when the Fruit Growers Express Company, through the courtesy of John J. Rill, then president, spotted their BREX 1400 Refrigerator Training Car at the NAPRE conventions. Classes were held daily for the benefit of the members and guests.

Field Trip Invitations

Earlier in the year, on learning that NAPRE was to hold its annual meeting in New Orleans, the president and general manager, H. L. "Jimmy" Brooks, New Orleans Cold Storage and Warehouse Company, Ltd., invited delegates to pay a visit to that firm's new single-story reinforced concrete and steel warehouse on Airline Highway. This structure is in direct contrast to the company's Gaiennie St. plant which is a multi-story mill construction and brick establishment built shortly after the turn of the century.

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R. E. Zach

Central Air Conditioning Plants, Apprenticeship Training To Receive Emphasis

The new plant was established in 1957. Typical of the modern concept, the new warehouse structure of this New Orleans firm is a distribution type operation, completely palletized. Refrigeration is 2-stage ammonia, as is the older plant. Both plants feature improved refrigerating techniques.

New Civic Center Plants

Leo J. Vivien, a past national president, NAPRE, and chief mechanical inspector, City of New Orleans, has plugged for daily mid-day visits to Civic Center sites. The new City Hall, completed in 1958, has 1600 tons of turbine driven centrifugal refrigeration capacity. The Civil Courts and Public Library buildings also have their own electric driven conventional centrifugal water chillers for comfort air conditioning applications, in which Vivien believes the delegates will have more than a passing interest.

Pre-Convention Tour of Tulane

Tulane University is another feature attraction in the opinion of Max Sofer, president, Louisiana Chapter No. 2. More than 100 members of the chapter recently toured the new central air conditioning plant at that seat of education. In the Tulane plant, called a dream for operating engineers by Sofer, the advanced guard was particularly impressed by two of the largest package boilers ever made.

Also of interest, of course, were the two centrifugal compressor-chiller units which provide cooling for 46 buildings on the Tulane Campus through the 22-mile long system of chilled water piping. Prior to this special chapter tour to inspect the air conditioning and heating equipment, the NAPRE members heard special addresses by Harold Pique, resident architect at Tulane, and by William H. Russell, chief design engineer for Weil & Moses, the consulting engineers.

Working Conventions

NAPRE conventions in the past 49 years have been known to be working affairs. Zach, newly appointed as convention program chairman, intends that the December meeting, 1959, will be no different. After announcing last month that he would deliver a paper himself—An Analysis of a Typical Lithium Bromide Cycle for an Absorption Refrigeration System—he followed up with a bulletin to the NAPRE chapters in which he instructed prospective members and delegates to the national meeting to review previous papers on the topic.

Free Technical Paper

How the Absorption Refrigeration System Works, by John G. Reid, Jr., a paper delivered to the National District Heating Association earlier in the year, was one of the assigned reading topics by Zach. Copies of that paper are available to members-at-large as well as chapter members. The other paper recommended is Water Vapor Absorption Plants by Thomas E. Kurtz, which appears in the 1957 NAPRE Operating Data Book.

Zach also called attention to the fact that Slavin, a member of NAPRE, has been a speaker at the International Institute of Refrigeration and has also presented a paper in Russia and other European countries on American refrigeration applications in the fishing industries.

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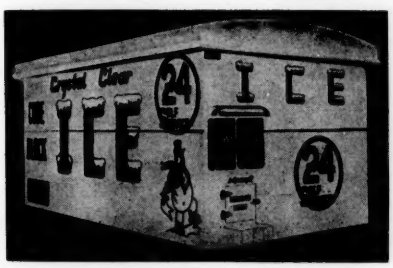

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VALVES AND ACCESSORIES FOR REFRIGERATION AND INDUSTRIAL APPLICATIONS

Queen Meets Queen

Wife Of NAPRE Past President Honored At Chicago Event

▶ROYALTY are received royally in Chicago. That was evident during the visit of her Royal Highness Queen Elizabeth, II, of Great Britain, in her recent visit to North America. Mayor Richard Daley and The CHICAGO TRIBUNE saw to it that her Royal Highness met some very practical people who turned out to be quite queenly also in human relations.

Volunteer helpers at the City's charitable centers were eligible to be chosen as three representative queens to meet the Empress. Mrs. John W. Neff, wife of NAPRE's Honorary Member and past national president Johnny Neff, headed the list named by prominent Chicago women who had been selected for the task by The TRIBUNE.

Attended Mayor's Dinner

Mrs. Neff dined with Queen Elizabeth, II, at the Hilton Hotel the evening of July 6. She and the other two Chicago queens were special guests of His Honor, the Mayor, when he tendered the City's welcome.

A volunteer practical nurse for ten years now at St. Vincent's Infant Assylum, Mrs. Neff was the first to tender "a queen's appreciation" to the TRIBUNE, the Mayor, and Miss Louise Hutchinson, feature writer, responsible for the arrangements.

Venemann Fund Gift From Kansas City

▶GREATER Kansas City Chapter, NAPRE, made a substantial contribution at midyear to the Association's Professor H. G. Venemann Memorial Educational Loan Fund. Aside from Industrial Membership contributions, and some individual gifts, this was the first substantial contribution received from an organized group in 1959. On a per capita basis it amounted to quite a few dollars per member of that chapter.

Chapter Met Thru Summer

Twice considering the subject, GKC Chapter, decided to meet all summer rather than discontinue meetings as had been the practice in the past. The chapter continues exploring the possibility of an adult education arrangement with recognized educational establishments in the area.

Oxy-Acetylene Practice

The July meeting dealt with basic principles and techniques of acetylene welding. Motion picture film was used to bring out construction, function and operation of the various devices in oxygen and acetylene systems. In addition, burning and welding techniques were demonstrated in the film presentation. A. C. Boyd, chief engineer, conducted this program for the July meeting which was held at the Federal Cold Storage plant.

NY Studies Refrigeration; Not Power Sources.

▶METROPOLITAN New York Chapter cannot be blamed as a group for contributing to the 13-hour blackout that occurred there in mid-summer. The chapter recessed after June 10 meeting.

Some Operating Practices Contribute To Overloading

However, as individuals, perhaps some of the engineers were adding to the power distribution woes of some of the New York utilities. Exceptionally high temperatures, more refrigeration and air conditioning, undoubtedly were the cause of the power failure.

When the chapter gets back into session this Fall there will be a number of programs devoted to ways and means the refrigeration and air conditioning engineer can reduce power consumption. Operating practices and even some maintenance procedures can influence power requirements.

Oil Behavior Studied, Sludge Analyzed

Wally Smith, technical service, General Chemical Div. of Allied Chemical Corp., closed the Spring meeting session on June 10 with a live demonstration. Wally, an associate member of NYC Chapter, did an excellent presentation on the behavior of oil in the refrigeration system. He also conducted a sludge analysis and reviewed the whole project with slide film.

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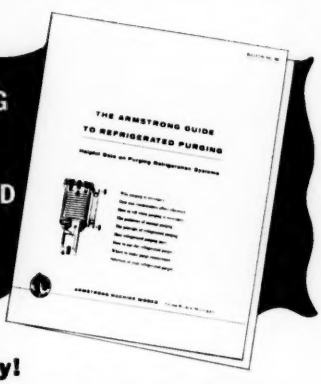
THE ARMSTRONG GUIDE TO REFRIGERATED PURGING



Ask for your free copy!

The new 12-page Armstrong Bulletin No. 700 gives you all this information on the removal of air from refrigerating systems: Why purging is necessary. How to tell when purging is necessary. The problems of manual purging. The principle of refrigerated purging. Where to make purge connections. Ask for a copy, today. We're sure you'll find it useful.

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Made by the manufacturers of Armstrong Steam Traps
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8605 Maple Street Three Rivers, Michigan

AN UNUSUAL REFRIGERATION APPLICATION

Controlled Process and Storage Enhances Hay Vitamin Values

By H. A. HALLS
Mgr., Refrigeration Products
Recold Corporation

FOR MANY CENTURIES some types of vegetation have been dried into hay to improve storage possibilities. Although making hay solved the storing problem, it was recognized that fresh feed provided much greater food value.

A few years ago some enterprising farmers decided that something could, and should be done to retain more of the food value in fresh alfalfa until it could be consumed by meat animals. There were two elements—moisture and heat—that started micro-organisms at consuming, or in other ways destroying, the carotene or vitamin-A content of the alfalfa within minutes after harvesting.

Where the making of hay is not a new art, it has, until recently, been accomplished by field drying. Everything depended on the weather. A rain at the wrong time would be disastrous. Or, if the hay was stored before completely dry, it could spoil before being used.

Alfalfa Stores At 28F

In the central part of California, one alfalfa grower recognized that removing natural moisture from vegetation also removed a large part of the food value; value that could not be replaced. He set about to find out just how much of this valuable natural moisture could be left in alfalfa and still not spoil.

It was found that alfalfa could be stored indefinitely at 28 F with a residual moisture content of nine percent. Conversely, nine percent of the natural moisture could be retained if cooled rapidly and stored at 28 F. Here, then, was an unusual application that could become quite usual, depending on whether or not it "paid off".

The alfalfa is grown on a 2500 acre plot which is part of a 6000 acre ranch. The land not planted to alfalfa is being prepared to yield the finest possible crop by putting it to other uses. Crop rotation is extremely important in growing alfalfa with the highest possible carotene content. It is harvested when a ten percent bloom has developed and is immediately trucked to the dehydrating plant by a fleet of 12 trucks.

Although 12 trucks are in use, only 6 drivers are employed. When a truck is driven in from the field, the driver parks it close to a group of giant hoppers, gets out and takes another that has been emptied and the dump bed steam cleaned. The incoming truck is unloaded into one of the giant hoppers and cleaned, ready for the next driver.

Meal Processing Details

As the hopper is filled (about 5 truckloads), it is dumped onto a conveyor which carries the alfalfa to a dehydrator where 91 percent of the moisture is removed in dehydration. After dehydration the "fines" are separated from the coarser alfalfa in a process known as "reeling". The coarse particles are conveyed to a grinder, ground into meal and rejoined with the fines which did not need grinding. From the time the alfalfa is dehydrated until it is sacked, all conveying is done by air through a system of ducts.

Specialty Water Cooler

After grinding, the meal is cooled to 50 F by passing it through a system of auger type coolers. The blades of the auger are hollow and chilled water flows through these augers counterflow to the alfalfa.

Following precooling, the meal is blown through a duct to the sacking room and immediately analyzed as to vitamin and protein content. The bags are then labeled and stored in two large warehouses held at 28F.

Water Defrosted Surface

The warehouses have a total storage capacity of 6800 tons and are cooled by 23 two-ton water defrost coils. Water defrost was selected to gain the advantage of washing dust and chaff from the coil surfaces that otherwise might become clogged. Defrost is automatic.

The processing plant has a daily capacity of 140 tons. The produce is sold according to vitamin and protein content and is used almost exclusively for meat animals and fowl.

What Constitutes An "Unusual Application"?

BEING FIRST might make an application unusual. However, if the application benefits society, surely other similar applications will follow. How long, then, before it is no longer unusual, but quite usual?

To be unusual and to retain its unusualness, an application would almost have to be special to the extent of meeting a "one time" need and then never repeated. There have been such applications, and the problems solved, have made interesting presentations. But such, as a rule, are more entertaining than informative.

In order that a session on unusual applications be as informative as possible, it would seem wise to look at some recent applications that, at the present, can lay claim to "unusuality", but, because of the benefits to society, should soon become quite usual.

Here then is an installation quite unusual only a few years ago, which will rapidly become quite usual.

COLDJET *Low Air Velocity*
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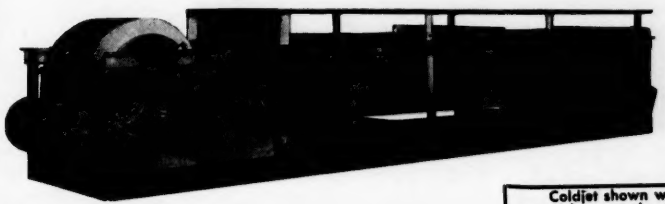

Coldjet shown with side panels removed. Cutaway shows 1" sealed-in cork insulation.

- Ceiling-suspended, saves space. (Fits between meat rails!)
- Gentle, quiet air movement eliminates drafts, adds to worker comfort.
- Cuts shrinkage of meat and other food products to a minimum.
- New design cuts installation and maintenance costs.

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MORE PERSONS IN THE NEWS

Industry Data Center For Insulation Manufacturers

▶ ESTABLISHED by the newly formed National Insulation Manufacturers Association, New York City, is an Insulation Information Center. Consultation service for industry on insulation characteristics, application techniques and specifications will be in charge of **John M. Barnhart,** association executive secretary, and **Raymond C. Parlett,** technical adviser and chairman of the association's Technical/Research Committee.

Barnhart is a former instructor in thermodynamics, heat transfer, heat power and hydraulics at Rensselaer Polytechnic Institute of which school he is a graduate in mechanical engineering.

Parlett has had 40 years experience in industrial thermal insulation in both research and development work as an engineer and department head. He is a licensed professional engineer, adviser to ASTM's thermal insulation committee and a representative to the National District Heating Association.

Reefer Truck Manager

▶ SALES MANAGER, Truck Refrigeration, York Div. Borg-Warner Corp., is **Paul A. Heber,** according to **C. B. Coombs,** Sales Manager of OEM & Mobile Products. Heber will be in charge of national distribution of truck refrigeration systems. Heber was formerly marketing manager, Automotive Air Conditioning with O. A. Sutton Corp., and has had previous experience with Sperry-Rand, Bendix Aviation Corp., and Allison Division of G. M. Corp.

Vice-Presidents

▶ RECENTLY promoted and transferred to the firm's head office in Houston is **Jerry Kaler,** vice-president, Pappas Refrigeration Co. in Beaumont, Texas. He will be General Sales Manager and assistant to the president, **James H. Pappas,** according to the Beaumont Enterprise. **John B. Tortorice,** Beaumont, was promoted to general manager of the local office.

▶ NEW VICE-PRESIDENTS at Carrier Corp., Syracuse, are **Frank R. Littlefield, Walter R. Steitler** and **Walter A. Grant.** The announcement, which appeared in the WALL STREET JOURNAL, indicated that each had received director assignments; Littlefield for manufacturing, Steitler for marketing and Grant for engineering.

Elected Director

▶ ELECTED to the board of directors, Superior Valve & Fittings Co. is **George R. Allen,** vice-president. Announcement was made by **W. A. Siegfried,** president. Allen joined Superior as general sales manager and was named vice-president in 1950. He has been active in the refrigeration industry for 27 years, is a member of ASHRAE, and represents his firm in ARI, CGA and LPGA.

HumKo Engineer Passes

C. E. Stacks

▶ CHIEF ENGINEER of the HumKo Company plant, Memphis, Tenn., **C. E. Stacks,** died at Baptist Hospital on July 22, as a result of a heart attack. He had been chief engineer of the HumKo plant for 25 years. An active member for 20 years of NAPRE and past president of Tennessee Chapter No. 1, Memphis, Stacks was also secretary of Local 92 International Union of Operating Engineers, for 10 years, member of the City of Memphis Board of Engineer Examineers for 10 years. He is survived by his wife, 5 daughters, 3 sons, 2 sisters, 2 brothers, 22 grandchildren and one great grandchild. He was 60 years of age.

Atlantic Executive Dies

▶ ANOTHER pioneer in the ice industry, **Francis W. Harris,** 72, died July 21 at Coatsville, Pa. He was co-founder and president of the Atlantic Ice Manufacturing Co. and was named "citizen of the year" at Coatsville in February 1957. A native of Scottsville, Virginia, he was a graduate of VPI, president of the Bank of Chester Valley, president of the local school board and president of trustees of the Presbyterian Church.

Chicago's Maginnis Passes

▶ CHAIRMAN of the board of directors, Lincoln-Boyle Ice Co., **Robert Emmett Maginnis,** died Monday, August 3. He was a director of the Chicago Ice Producers Mutual Liability Company, member of the Chicago District Ice Association and father of Robert Maginnis, vice-president Illinois Association of Ice Industries.

Dairymen Passing

Other deaths in the food industries included **Wilber L. Parkin,** founder of the Parkin Ice Cream and Dairy Co. in Marshfield, Wis.; **J. A. Robins,** chairman of the board, Fairmont Foods Co., Omaha, Nebr.; **John W. Saari,** general manager, Foremost Dairies, Inc. Montgomery, Ala., and **J. Alexander Webb,** vice-president and board member, Abbotts Dairies, Pittman, N. J., according to the IAICM NEWS LETTER.

Better News, Next ▶

Minich With A & P National Bakery Div.

ANNOUNCED AT mid-year was the employment of **Quaid Minich** by the National Bakery Division of The Great Atlantic and Pacific Tea Company. Minich, the national treasurer of NAPRE, and secretary of the Greater Metropolitan New York Chapter will be in charge of all refrigeration installations and operations of the National Bakery Division on a national basis, according to **R. G. Vogel,** First Vice-President. His headquarters will be in the Graybar Building, New York City.

Minich, a marine engineer, was employed post World War II by a refrigeration sales engineering organization in San Francisco and Seattle. He later became chief engineer, then manager of cold storage firms, operating in Prosser Wash. and Kansas City, Kan.

At Kansas City, Minich was active with NAPRE Board Chairman **Leland Kenagy** and National Director **John Muller** in the formation of the Greater Kansas City chapter which embraces the cities on both sides of the Missouri River. He helped reorganize the Greater Metropolitan New York Chapter when he became the chief engineer of the Seaboard Terminal and Refrigerating Co. Div. of City Products Corp., several years ago when he transferred from Kansas.

Nashville Freezer Officers

MOVED UP to presidency of the Nashviller Freezer & Storage Co. Inc., is **James E. Beasley, Jr.,** succeeding **Burgess Askew.** Other officers named were **J. N. (Bull) Brown,** vice-pres., and **Noah B. Moates** as secretary-treasurer. **George Knight** remains as plant manager and **Mrs. Mildred Ray** as office manager.

Plans have been made for a substantial expansion in the poultry processing phase of the business, according to the NASHVILLE TENNESSEE BANNER. Besides other food processing, the Nashville operations include custom freezing and public cold storage.

Beasley is president of the Sweet Sue Poultry Co. of Athens, Ala., Brown is associated with Anheuser-Busch, Inc. as their Tennessee and Southeast representative and Moates is Tennessee manager of the Business Men's Assurance Co. of America. Beasley, according to Moates, has considerable distribution in the Nashville area for his poultry, as well as the processing and production facility.

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Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

Position and Help Wanted

WANTED—Plant manager, by large ice company in Southern California. Must have knowledge refrigeration and be energetic to get ahead. Give experience, age, reference in first letter. Address Box AU-4, c/o Industrial Refrigeration.

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FOR SALE—Complete equipment of 70 ton ice plant, mostly York, including ammonia compressors, ranging in size from 6"x6" to 11"x13", all with 220 volt motors and controls, except the 11"x13" which is direct connected to 100 h.p. synchronous motor. Also 780 good galvanized ice cans, size 11"x 22"x46"-46½" with LH ⅛" OD tube and 2" socket. Condensers, air compressors, water brine and ammonia pumps and miscellaneous items. Priced to sell. Starr Brothers, 1129 Broadway, Mt. Vernon, Ill. Phone 202.

WANTED — good used ammonia compressor. Approximately 60 ton capacity, 440 volt motor. Also, horizontal shell and tube ammonia condenser 100 ton plus, not over 15 feet long, approx. 30 inch diameter horizontal receiver not over 16 feet long. Chun King, Jackson, Ohio.

WANTED FOR CASH — late model refrigeration equipment, compressors, condensers, etc. What have you for sale? For more than 45 years we have been of service to the processing industries, and you will be pleased with the manner in which we do business. Come to "Headquarters"; CHAS. S. JACOBOWITZ CORP., 3080 Main St., Buffalo 14, N.Y. Phone AMherst 2100.

FOR SALE — AMMONIA EQUIPMENT
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1—10"x10" 4 cyl. York duplex DC to 225 h.p. Motor, 300 r.p.m.
1—9"x9" 4 cyl. York duplex DC to 150 h.p. motor, 300 r.p.m.
2—9"x9" 2 cyl. York DC to 75 h.p. motor.
1—10"x10" 2 cyl. York DC to 125 h.p. motor.
1—9"x9" 2 cyl. Frick compressor.
1—6½"x6½" 2 cyl. York compressor.
1—3"x3", 1—4"x4", 2—5"x5" condensing units.
3x3", 4x4", 5x5", 6x6" compressors.
11x22x51" 300 lb. ice cans, also 11x22x47" ice plants, 25 to 100 ton capacity, complete.
10 shell & tube condensers, 25 ton capacity.
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FOR SALE
9x9 York duplex unit, 200 h.p., 360 r.p.m.
(2) 1½ h.p. Carrier floor mounted air diffusers.
10 h.p. two stage air compressor, 175 lbs.
(2) 6 cylinder 3-3/4x3 York "Freon" compressors. 75 h.p., 1200 r.p.m. motor.
Motor generator sets, air compressors, etc.
JOHN F. CARSON
A & Venango Sts., Philadelphia 34, Pa.
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FOR SALE — 100 KVA Diesel engine generator sets in equal to new condition; Worthington BB5 engine 150 h.p., 600 r.p.m. direct connected to Westinghouse generator 3/60/440 with top mtd. belted excitor. Worthington evap. cooler, air starting equip., West. switchgear. Inspect our premises. Construction & Power Machinery, Inc., 5361 Kings Highway, Brooklyn 3, N.Y. GLenmore 1-0700.

FOR SALE — at former Duffy Silk Mill, Buffalo, N.Y., Worthington Model ECZ-501 40-ton evaporative condenser, 2 years old; 2 Carrier 7½ h.p., 440 volt, self contained methyl chloride compressor; 1 Carrier 15 h.p. same as above; 1 Worthington 25 h.p. compressor, 220/440, 60 cycle, 3 phase, self contained; 1 Worthington 20 h.p. compressor, 220/440, etc., same as above; 2 Worthington Y model, methyl-chloride compressors 60 h.p. each, self contained, misc. other equipment. Free listing or inspect in Buffalo. Communicate with exclusive sales agents, Chas. S. Jacobowitz Corp., 3080 Main St., Buffalo 14, N.Y. Phone AMherst 2100.

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Uni-Crest is an extremely lightweight homogeneous white material with a smooth, tough surface. It is composed of minute, individually closed cells, produced by expanding beads of polystyrene. Its inherent properties make it an excellent low temperature insulating material.

Uni-Crest has a low K factor (thermal conductivity) and retains its insulating value indefinitely. Lightweight, strong, flexible, it has excellent bonding characteristics, is non-dusting and non-flaking, and can be cut and handled easily. Uni-Crest is inexpensive, too.

Uni-Crest is available in widths up to 4′, lengths to 12′ and thicknesses from 1″ to 8″. Self-extinguishing Uni-Crest is also available in the same sizes. Write today for complete specifications and installation information.

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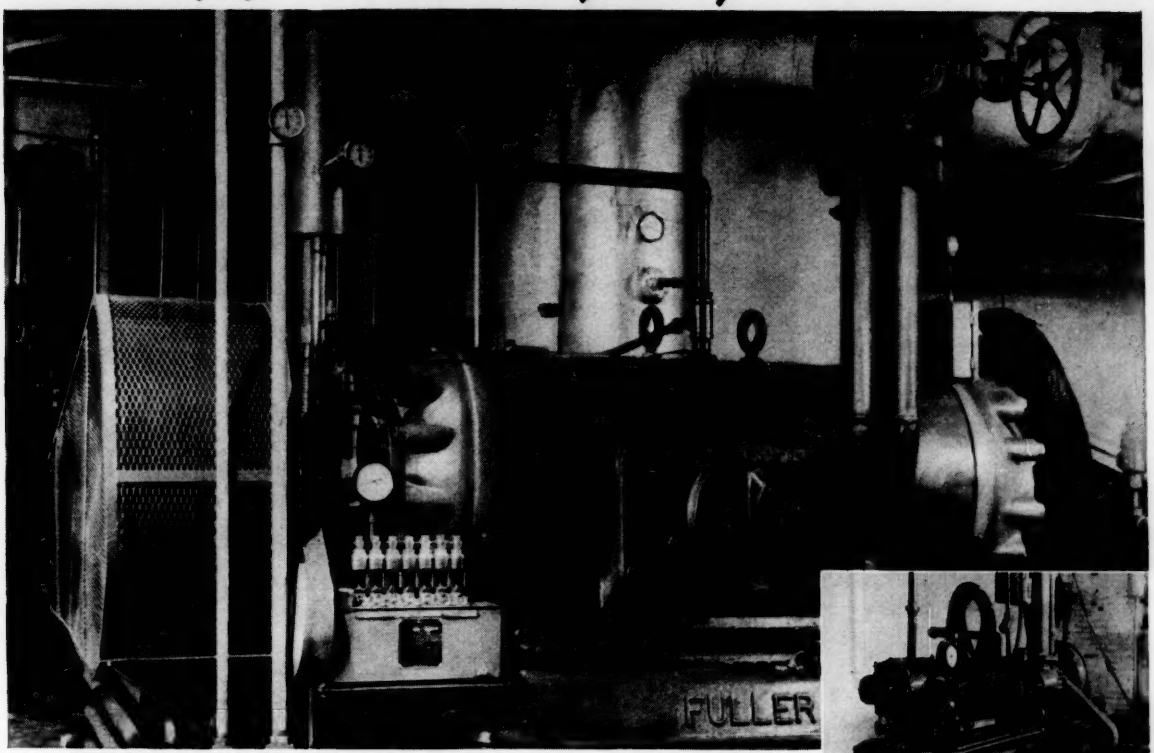
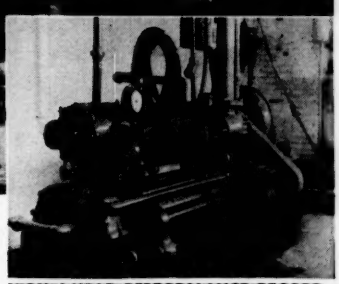
More Proof of FES-FULLER *Superiority*



"FES-Fuller type A-250 rotary booster compressor nearly doubles Liebmann's freezing capacity," says Herb Liebmann, Jr., of Liebmann Packing Co. Adding 100 tons of refrigeration to 110 tons supplied by existing reciprocating booster, vibrationless rotary takes light foundation—which cuts this installation cost 25%.



HIGH 6-YEAR PERFORMANCE RECORD of this Fuller C-50 rotary compressor supplying plant air led Liebmann to investigate and buy FES-Fuller rotary booster unit. Design principle is identical with that of booster units, using only 3 moving parts: rotor, sliding vanes, and bearings.

"VALVELESS" ROTARY BOOSTER COMPRESSOR CUTS INSTALLATION COST 25%

Designed without suction or discharge valves, an FES-Fuller rotary booster compressor can work more efficiently at low pressure and high gas volume than comparable types. Thus, in a two-stage system like the one at Liebmann's Green Bay, Wis. plant, even very low pressure differences can't hinder its output. Efficiency actually *increases* when system pressure drops.

Liebmann discovers extra benefits. "We wanted a compressor to handle high volumes of low-pressure suction gas in the primary phase of our recently expanded freezing system. The machine had to be rugged and trouble-free, keep original capacity for life, and be easy to install," states Herb Liebmann. Besides meeting these specifications amply, the 100-ton FES-Fuller unit takes only 10 x 12 feet of engine-room space, and cuts estimated installation cost by 25%. A light foundation is all that's needed, since rotary compressors work without vibration.

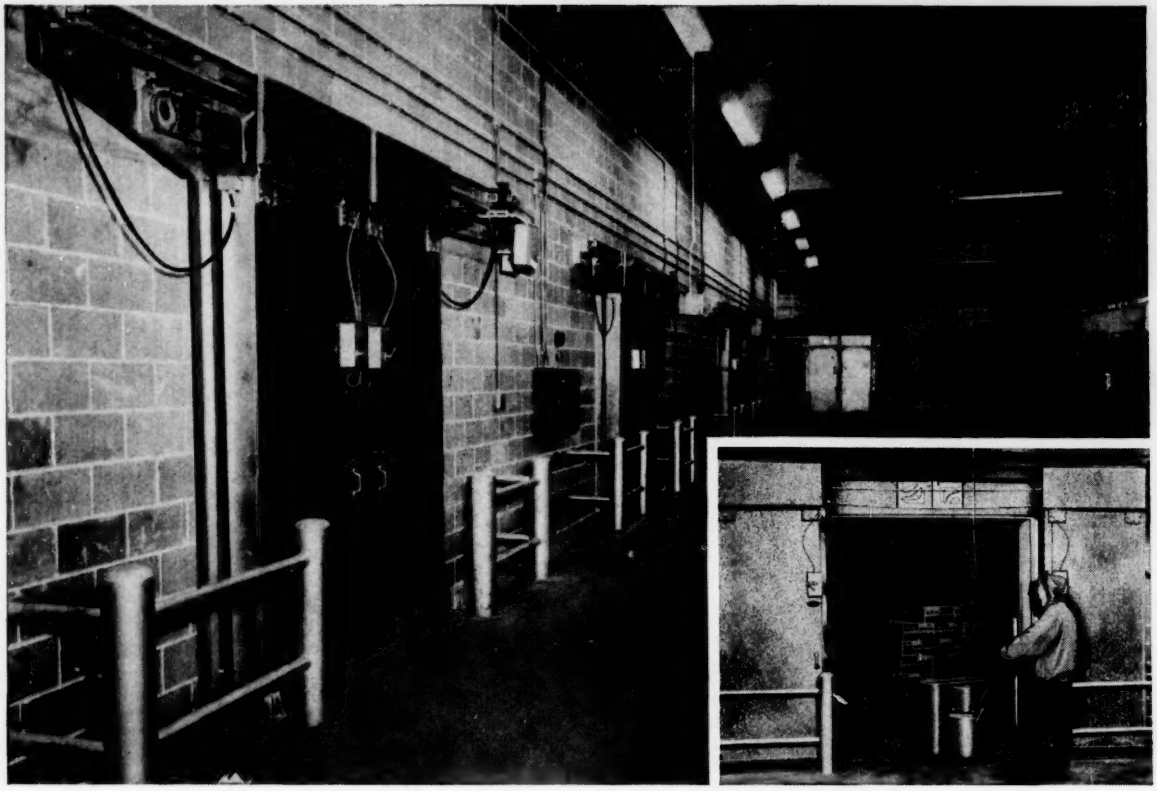
Advantages like these can be yours with FES-Fuller rotary boosters. Their simple, compact design gives big savings in space, power, money and maintenance time. They can run with almost no supervision. Patented jacket cooling of FES-Fuller rotaries eliminates freezeups. Consult FES-Fuller on the best ways to add to your freezing capacity or to design profitable new facilities. Freezing Equipment Sales engineers are always ready to help you. Write today for information and detailed literature on FES-Fuller rotary booster systems.

FES FULLER 1343 C-342

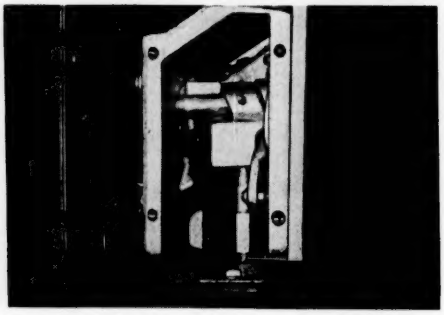
FREEZING EQUIPMENT SALES, INC., 1405 N. DUKE Street, YORK, PA.

Qualified distributors in principal cities

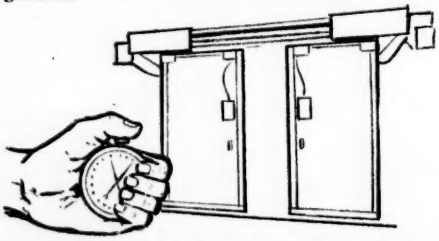
LOW TEMPERATURE FREEZING EQUIPMENT



9 Jamison Electroglide® Doors handle heavy traffic—save refrigeration



COMPRESSION SEAL—refrigeration savings assured by cam lock—in and down action on gaskets.



SMOOTH, SHOCK-FREE OPERATION—exclusive Electroglide spring cushion chain link absorbs inertia on opening, absorbs momentum when stopping.

Insulator: Mid Continent Industrial Insulation Co., Kansas City, Kansas.

Contractor: A. W. Soderberg Construction Co., Wichita, Kansas.

• In Wichita, Kansas, at the big Safeway Cold Storage Warehouse, nine Jamison Electroglide Power Operated Cold Storage Doors demonstrate how they permit high volume, high speed warehouse operation.

Exclusive Jamison features of the Electroglide assure fast, positive operation with safety to personnel.

LEVEL RIDE—opening and closing without gasket wear or drag.

RANGE OF TYPES—available bi-parting and single leaf left or right hand operation.

PADLOCK WITH SAFETY—emergency inside release.

MANUAL OPERATION—possible when power is off.

For Electroglide bulletin—Write Jamison Cold Storage Door Co., Hagerstown, Md.

JAMISON

COLD STORAGE DOORS